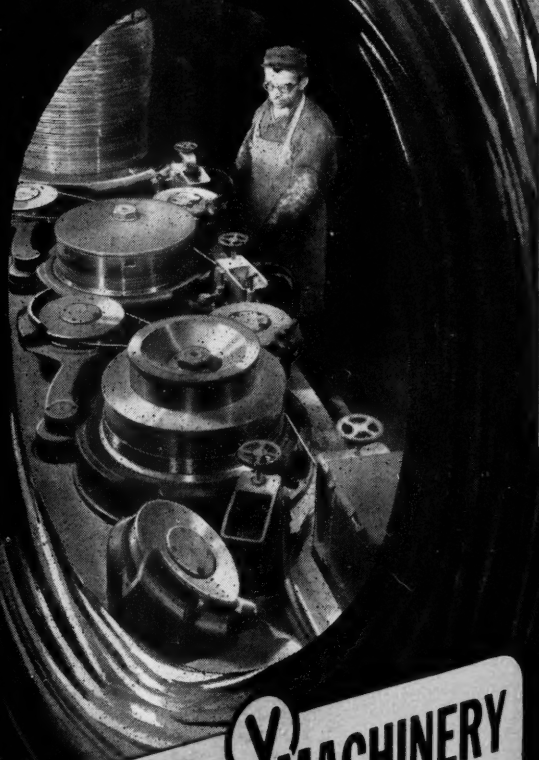
SEPTEMBER 1947

WIRE AND WIRE PRODUCTS



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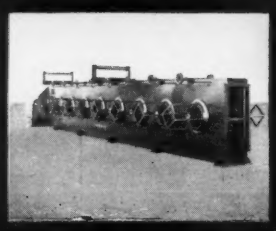
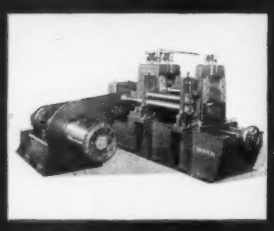
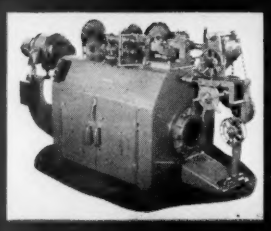


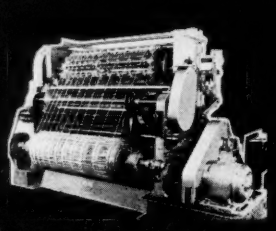
16 Block Wire Galvanizing Frame



Strip Reel and Slitting Unit



Barbed-Wire Fence Machine



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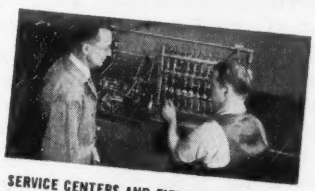

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WIRE & WIRE PRODUCTS, Vol. 22, No. 9, September, 1947. Publication Office, at 61 Cliff St., New York 7, N. Y. Executive Office, 300 Main St., Stamford, Conn. Published monthly by the Quinn-Brown Publishing Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year; 50 cents per copy; Foreing, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.

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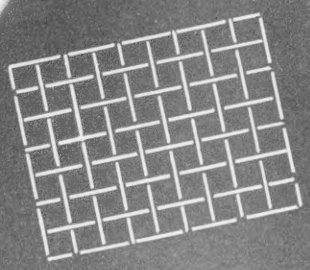

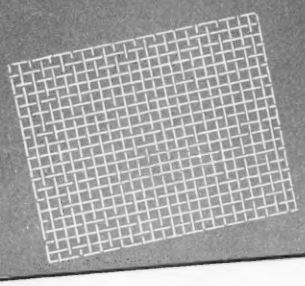

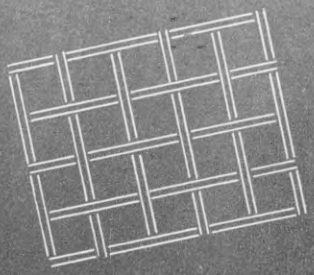

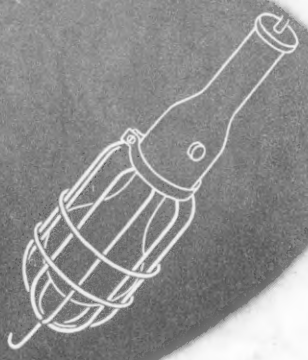

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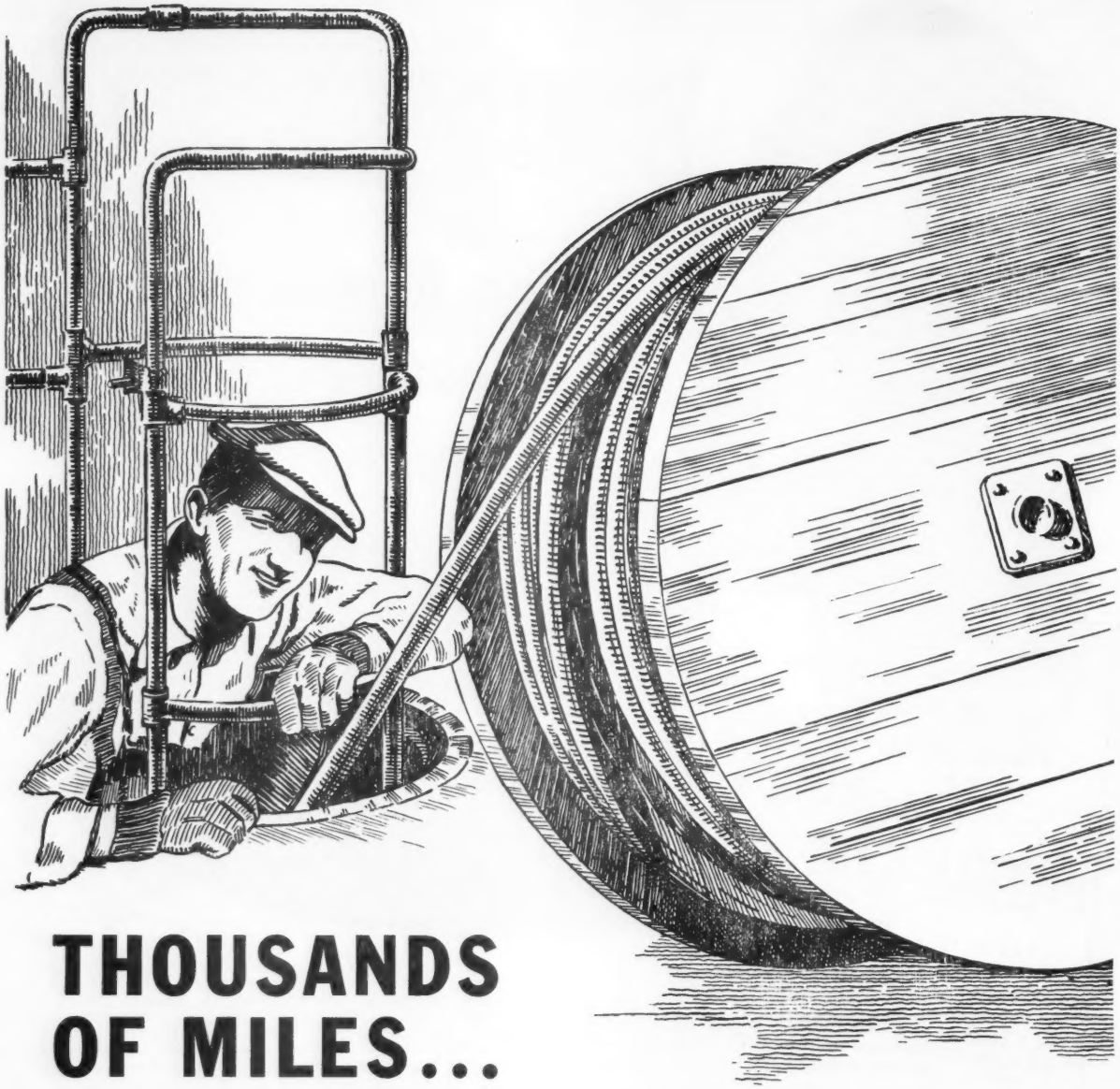

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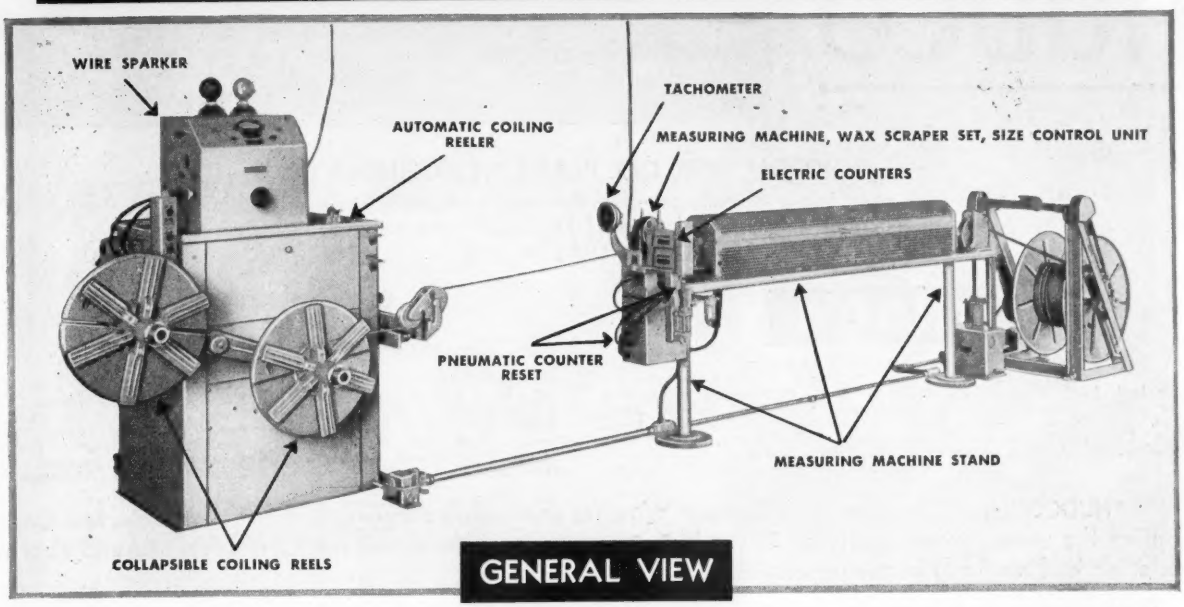
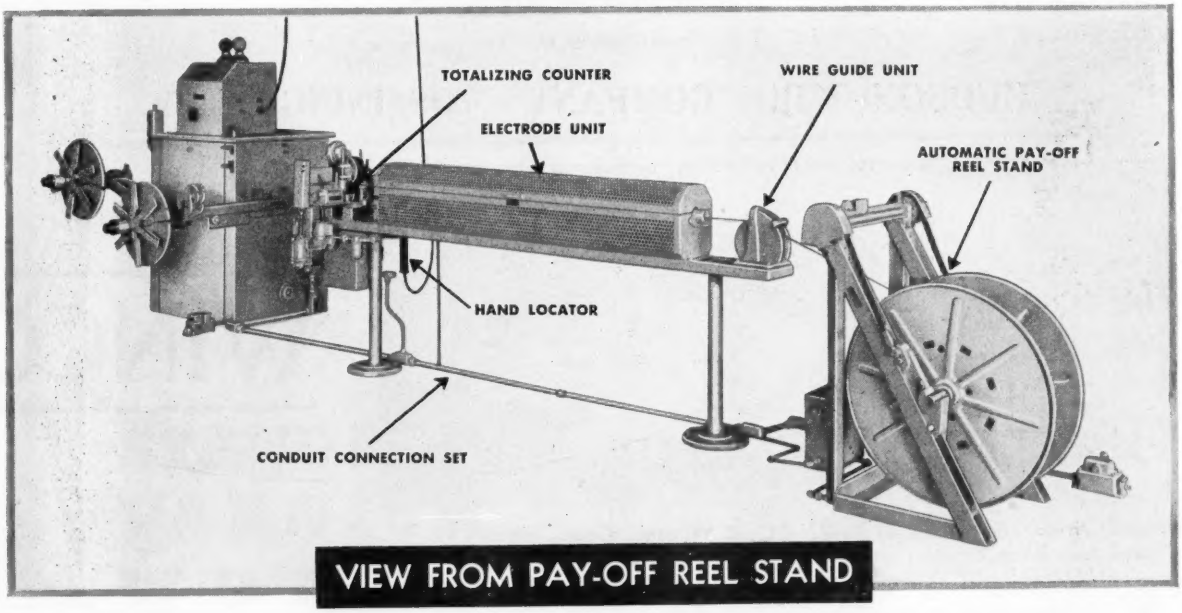


GENERAL VIEW



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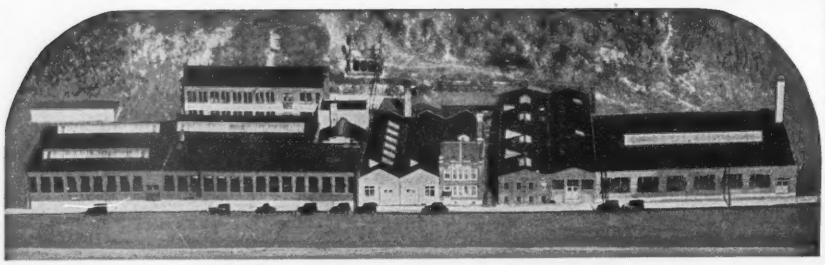

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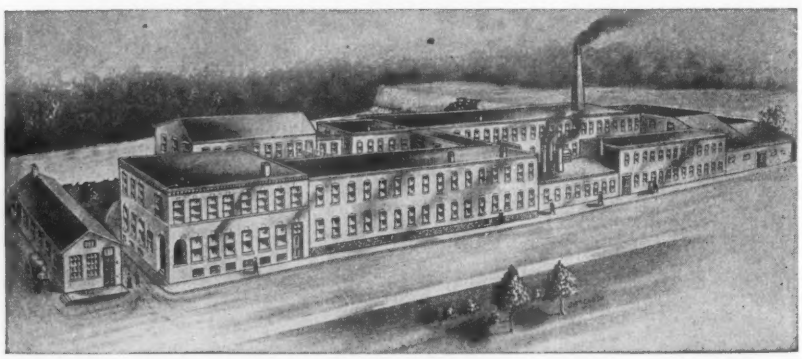

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"WINCO" enamelled wire is available in all standard and special coverings made to meet exacting requirements.

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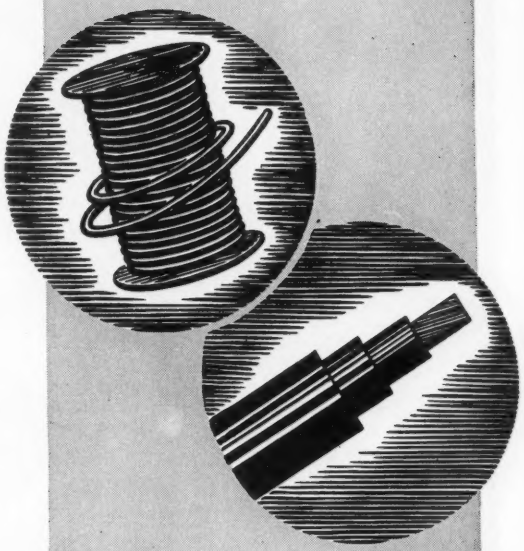

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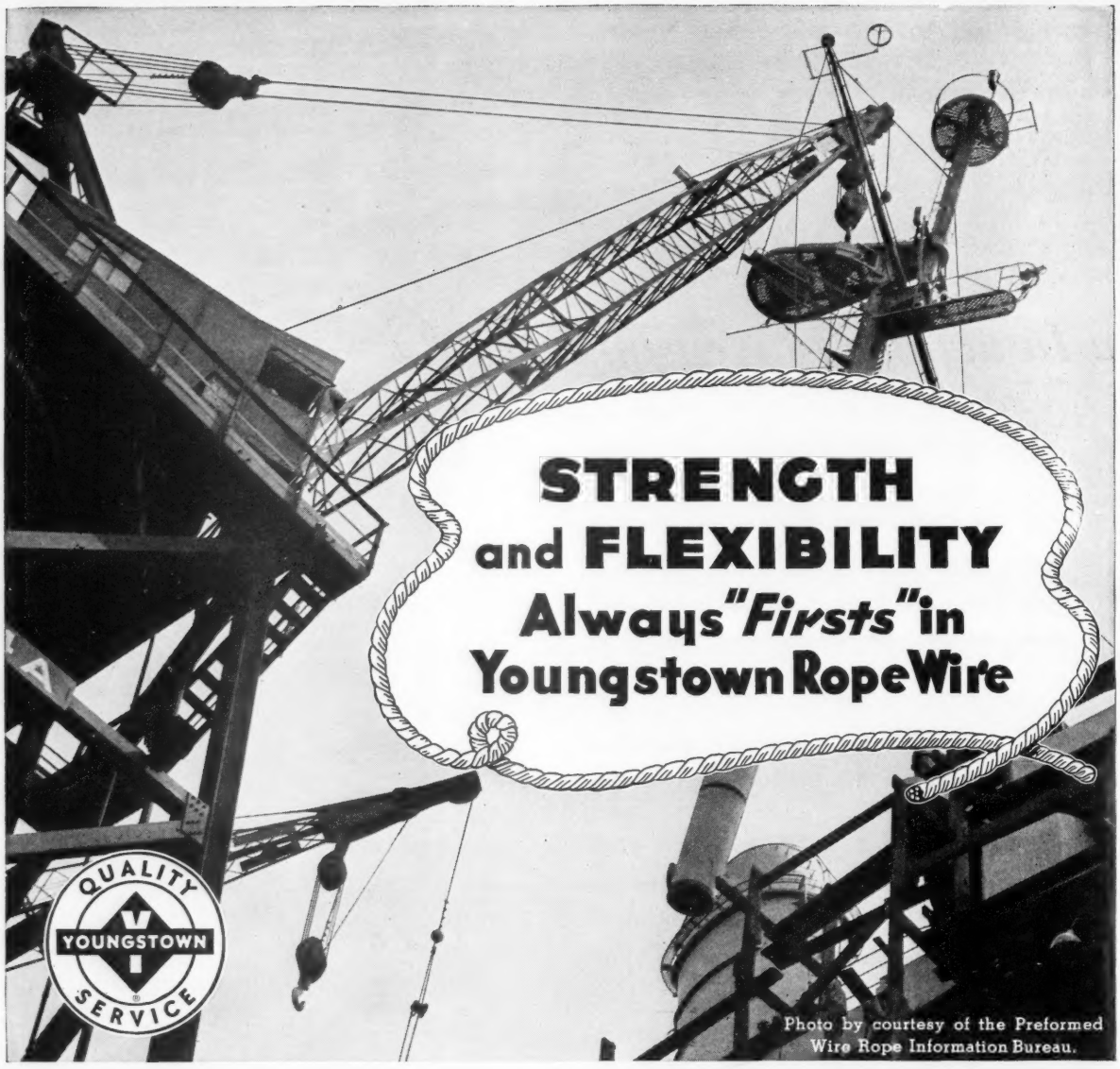

Neptune's Workshop

IN the shipyards, steel cable must be of proven, dependable quality. It must have plenty of extra strength for continuous lifting of many-ton loads. It must flow over sheaves fast, smoothly, with never a kink. It must have long life.

Much of the steel cable used in "Neptune's workshops" is fabricated from Yolectro High Carbon Rope Wire. Like all other Youngstown wire mill products, this wire is of finest quality steel, refined, rolled and drawn to rigid specifications, to make a product carefully balanced as to strength, flexibility, and toughness.

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Why not let our Engineers collaborate with you in conducting tests at your convenience for improving your die-life and finish, and increasing production over your present wet wire drawing operation? If you will write us, we will gladly arrange for samples and service. Address —

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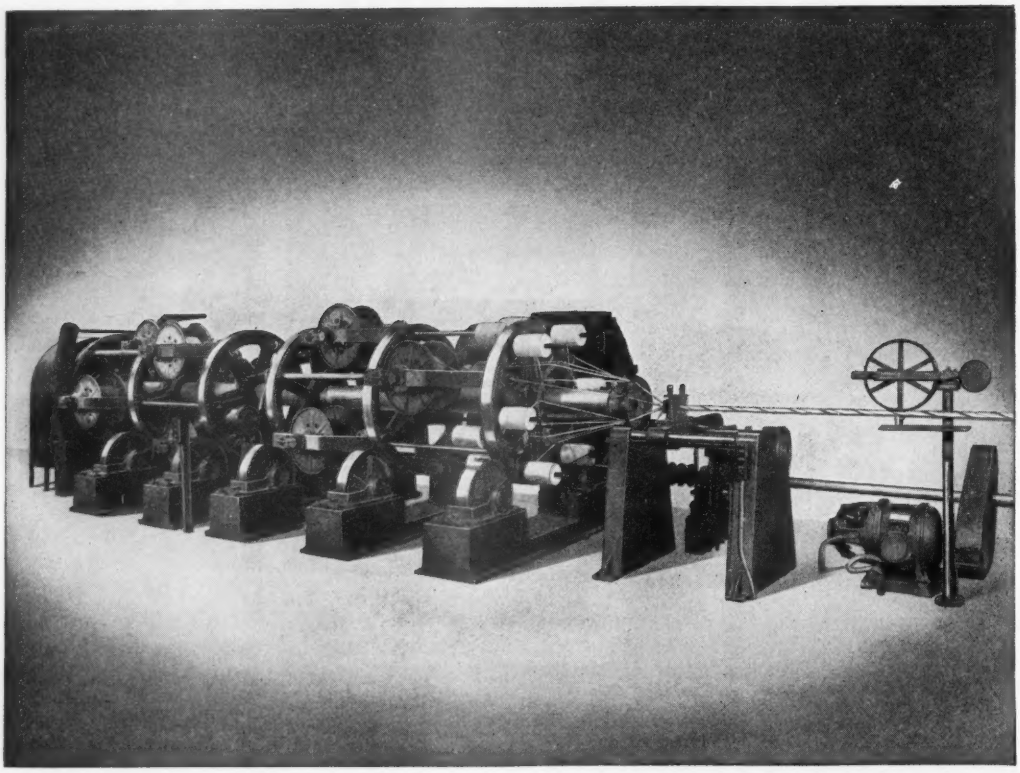
PLANETARY STRANDER



The machine illustrated is a 12-reel, 500-pound spool, PLANETARY STRANDER which operates at a maximum of 125 RPM.

These machines are equipped with:

Positive locking reel arbors
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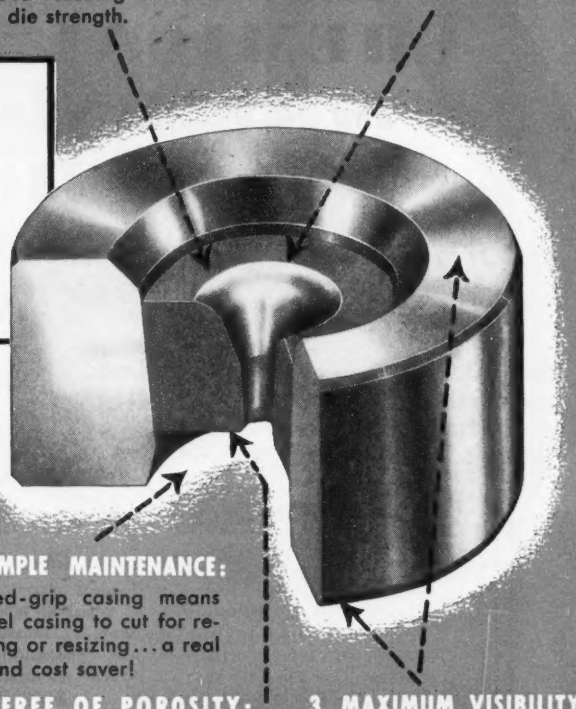
V-R

TANTALUM/TUNGSTEN CARBIDE DIES!

assure you of...

1. GREATER STRENGTH:
Tapered nib design increases absorption of drawing stresses. Side walls of nib are taper-gripped resulting in tremendous die strength.

4. CONCENTRICITY:
V-R method of precision die manufacturing assures you of a perfect, concentric drawing surface.



2. SIMPLE MAINTENANCE:
Tapered-grip casing means no steel casing to cut for refinishing or resizing... a real time and cost saver!

5. FREE OF POROSITY:
Another outstanding achievement is the V-R die quality control for the elimination of porosity in carbide. In addition, V-R Tantalum/Tungsten carbide die nibs take a higher finish than any other die material.

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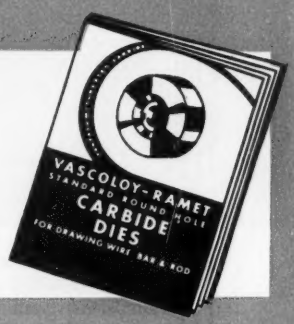

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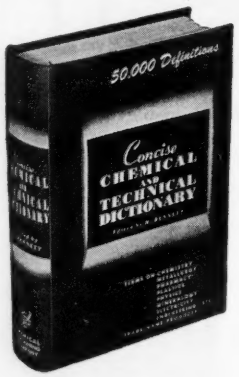

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For the 1947 Technical Convention the Wire Industry will foregather in Chicago, Ill. at the La Salle Hotel October 20th — 23rd to participate in an exceptionally fine series of technical sessions and to re-appraise the problems of production in the light of the new conditions that peace imposes on our industry.

Besides the technical sessions, ample opportunity is afforded to members to meet with others and exchange ideas on many technical and practical questions that do not lend themselves to discussion in meetings. These exchanges of views between wire men and between them and equipment and material suppliers have often led to the development of new equipment and processes in such manner as to bring about notable advances in production techniques.

It is sincerely hoped that as many as possible of the wire industry, producers and suppliers, will take this occasion to attend and profit by the facilities of the Convention to further the interests of the industry in getting off to post-war production on the right foot. Your attendance at and participation in the affairs of the Convention will help to lay a firm foundation for a sound future for our industry.

Remember the time, the place and the date, and

BE THERE!

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

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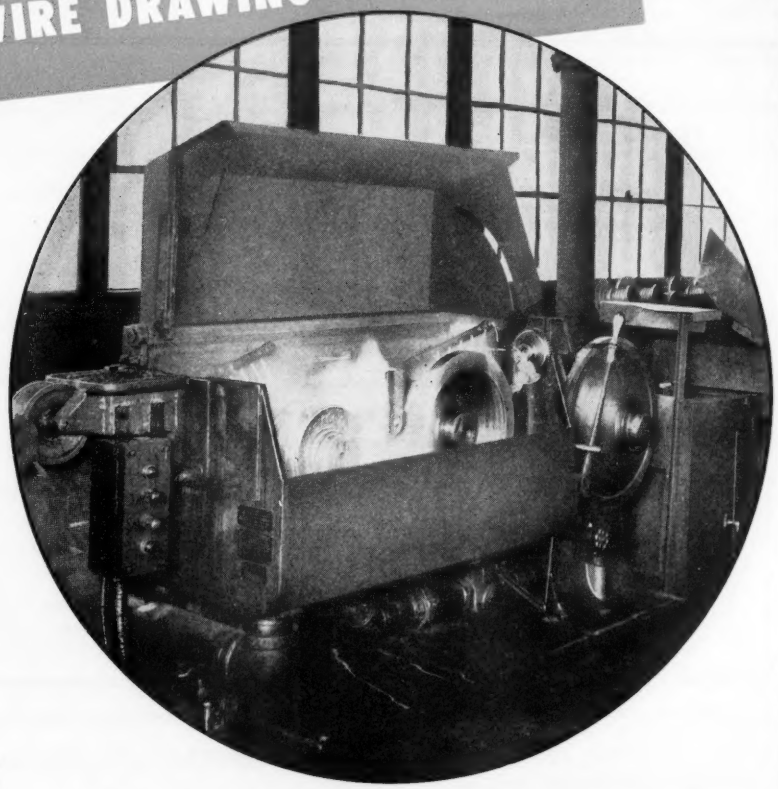

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* * *

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Raising Cocker Spaniels

Member of Wire Association

* * *

Secret Ambition:

Wants to be a Gentleman Farmer and raise nothing but his hat!

— The Technical Sessions —

RESEARCH PAPERS ARE REPRINTED IN THE OCTOBER ISSUE OF WIRE AND WIRE PRODUCTS

The Discussions and the Mordica Memorial Lecture Will be Printed in the January, 1948 Issue of Wire and Wire Products

MONDAY, OCTOBER 20

Afternoon Session—2:00 P. M.

by Dr. F. R. Morral, Metallurgist
Chairman of Meeting

American Cyanamid Company, Stamford, Conn.

OPENING ADDRESS — Rowland M. Hussey — President of the Wire Association

A Symposium — "IMPROVEMENTS IN THE WIRE INDUSTRY IN THE LAST 10 YEARS"

Arranged by Ralph B. Roth, Vice-President — Ludlow-Sayler Wire Company, St. Louis, Missouri

A Symposium — "OUTLOOK AND PRESENT TREND OF THE WIRE INDUSTRY"

TUESDAY, OCTOBER 21

Morning Session—10:00 A. M.

L. H. Winkler, Metallurgical Engineer
Chairman of Meeting

Bethlehem Steel Co., Bethlehem, Pa.

PAPER: Electric Salt Baths for Wire Processing — H. J. Babcock, Research Engineer — Ajax Electric Co., Inc., Philadelphia, Pa.

PAPER: Hi-Carbon Wire Drawing — James H. Janssen, PhD., Metallurgist — Wickwire-Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo, N. Y.

TUESDAY, OCTOBER 21

Afternoon Session—1:00 P. M.

PLANT INSPECTION TRIP
Wire Mill—Republic Steel Corp., Chicago, Ill.

Busses leave Hotel promptly at 1:00 P. M.
Please register for trip — Transportation $1.50

WEDNESDAY, OCTOBER 22

Morning Session—10:00 A. M.

Matthew J. Donachie, Consulting Engineer
Chairman of Meeting

Holyoke, Mass.

PAPER: Wrought Aluminum Alloys, Their Properties, Heat Treatment, and General Characteristics — H. S. Spaulding, Plant Metallurgist — Reynolds Metals Company, Louisville, Ky.

Discussion: "IMPROVEMENTS IN METHODS OF CLEANING NON-FERROUS METALS."

PAPER: Measuring Diameter of Fine Wire — Robert W. Carson, President — Carson Micrometer Corp., Little Falls, N. J.

Papers not received in time for preprinting will be published in the November and December issues of Wire and Wire Products.

WEDNESDAY, OCTOBER 22

1:00 P. M.

WIRE ASSOCIATION LUNCHEON — HOTEL LA SALLE

WIRE ASSOCIATION MEDAL AWARD

THE MORDICA MEMORIAL LECTURE

F. TITUS UPDIKE, CHIEF ENGINEER,

Products Engineering Department
Round and Rolled Wire Division
John A. Roebling's Sons Company, Trenton, N. J.

DEMONSTRATION OF THE MAGNETIC WIRE RECORDER
by J. S. Kemp, Engineering Advisor, Armour Research Foundation
Illinois Institute of Technology, Chicago, Ill.

(Members are at liberty to bring guests. Ladies are welcome)

WEDNESDAY, OCTOBER 22

3:30 P. M.

Wire Association Annual Meeting

Rowland M. Hussey,
President, The Wire Association

CHAIRMAN OF MEETING

WEDNESDAY, OCTOBER 22

Evening — 7:00 P. M.

ANNUAL DINNER — STAG SMOKER — HOTEL LA SALLE

THURSDAY, OCTOBER 23

Morning Session — 10:00 A. M.

H. P. EDINGA
Factory Manager

Elmet Division
North American Phillips Co., Inc.
Lewiston, Maine.

Chairman of Meeting

PAPER:
The Fabrication of Tungsten Wire

Sidney Schein
and Jack W. Forbes

Cleveland Tungsten, Inc.
Cleveland, Ohio.

A Symposium

"WORLD WIDE WIRE INDUSTRY"

THURSDAY, OCTOBER 23

Afternoon Session — 1:00 P. M.

PLANT INSPECTION TRIP

Hawthorne Works — Western Electric Co.

★ ★ ★

Busses leave hotel promptly at 1:00 P. M.

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Please register for trip — Transportation $1.50

THE WIRE ASSOCIATION MEDAL AWARD

For the Most Meritorious Paper on Wire Manufacture or Fabrication During the Year
— BY A MEMBER OF THE WIRE ASSOCIATION —

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Convention.

★ ★ ★

AN annual medal will be awarded for the papers coming nearest to the requirement set forth above.

★ ★ ★

CONSIDERATION for the Medal Award is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

★ ★ ★

ALL papers submitted become the property of the Wire Association and the Board of Directors constitutes the Committee on Awards.

★ ★ ★

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Program Committee and the Board of Directors of the Wire Association.

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BELL'S invention of the telephone provided a rapid means of communication — and created a huge market for the wire industry.

To meet this and many other demands, the Syncro **T-2 Spooler** was originally designed and built for a prominent mill to enable it to reduce shut down time of its heavy duty rod breakdown drawing machines, and thus increase their efficiency.

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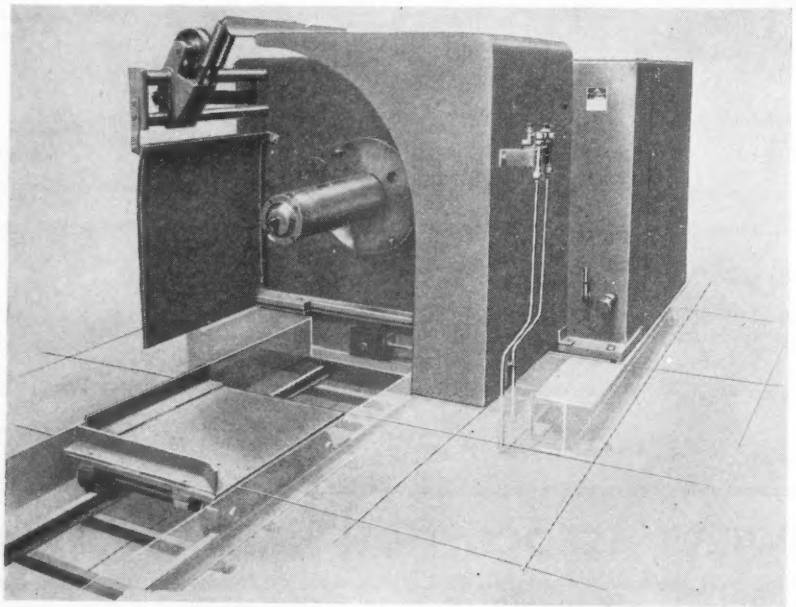

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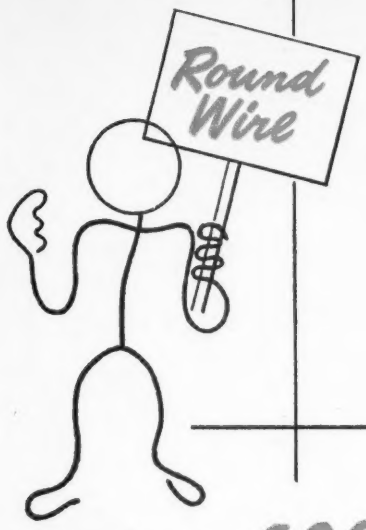

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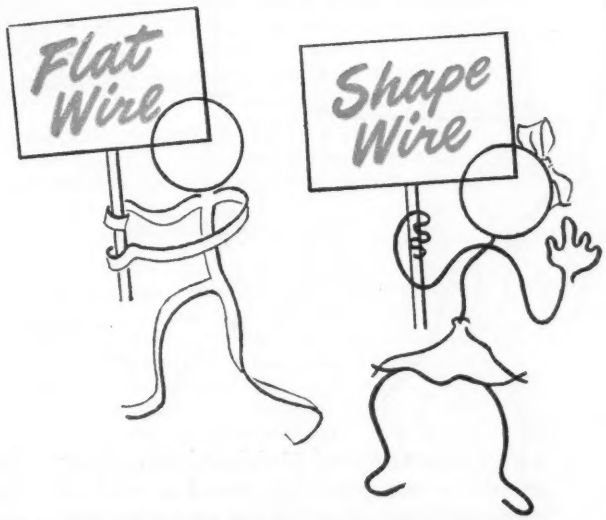

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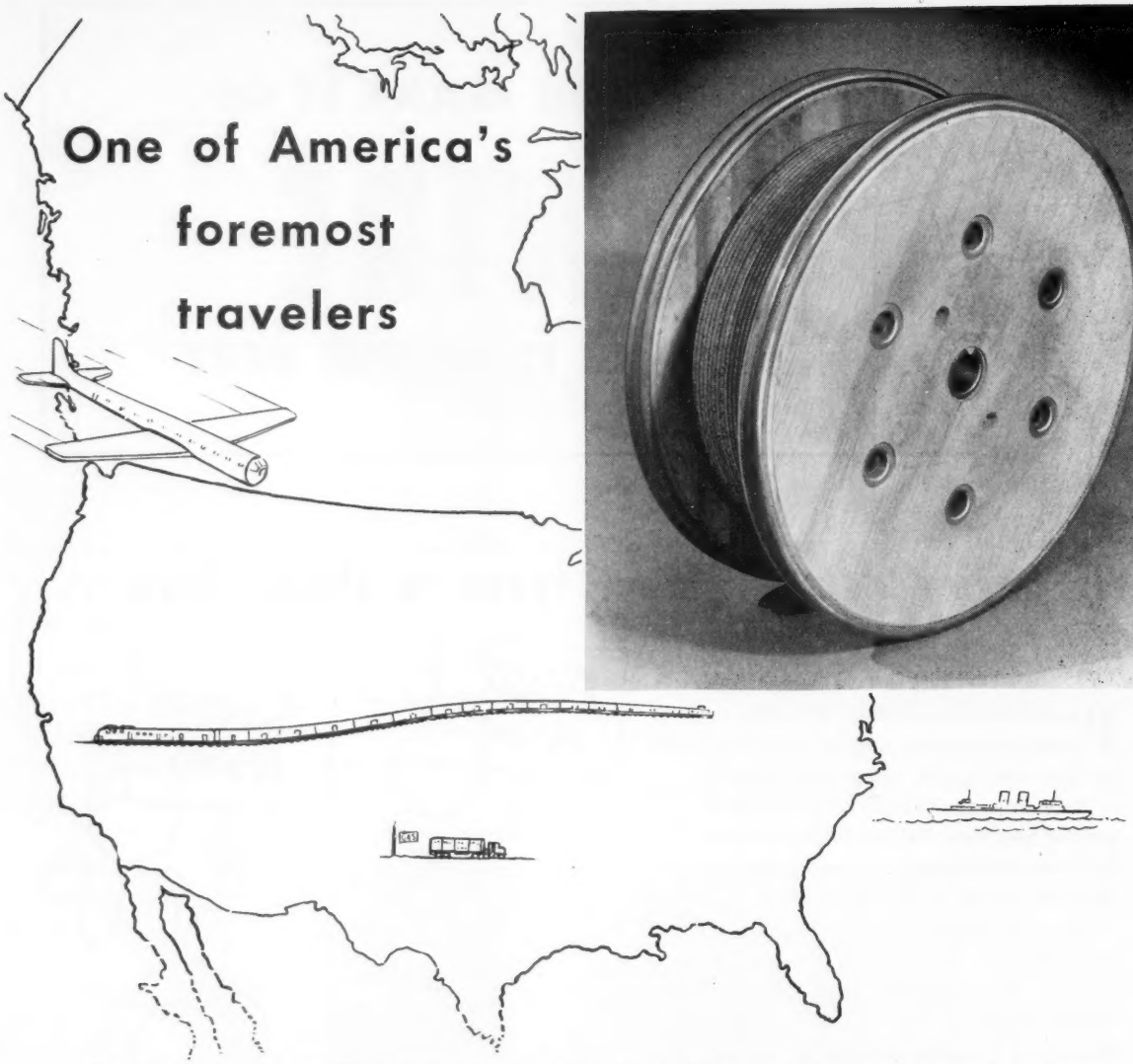

The thousands of Hubbard shipping spools in use probably travel a total of more millions of miles per year than any other industrial product. Added to that, they probably take more abuse and heavy handling than any other type of shipping unit. In spite of that, they stand up for months and years, providing a dependable low-cost means for shipping wire . . . and providing wire mill customers with an easy method for handling wire when received.

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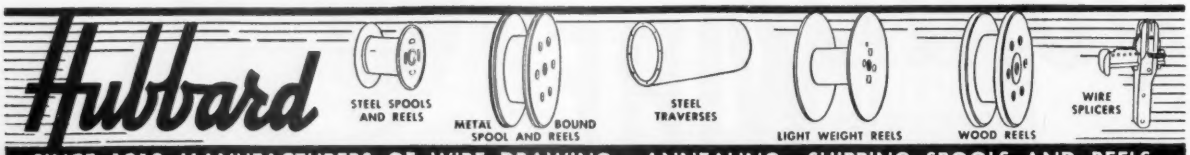


SINCE 1912 MANUFACTURERS OF WIRE DRAWING · ANNEALING · SHIPPING SPOOLS AND REELS

The Wire Outlook

Just one year ago we expressed the opinion that instead of recession and lower prices, there would be a steady upward trend with continued good business. So far everything has tended to substantiate this opinion. Union pressure for higher wages has brought substantial and inevitable higher price levels. Demand for consumer goods has shown no let-up, so that it becomes apparent that the much advertised recession is not only now less probable but actually highly improbable.

Behind the inflationary forces, it must not be forgotten, is a burdensome national debt, which together with several other factors, will maintain the trend toward higher prices a decade.

Among these other factors are the refusal of the government to retrench substantially in its extravagances, the delay in reducing confiscatory taxes on individuals and business; our embarking on a world-wide policy of spending to prime the pumps of foreign countries (which in the end will be neither appreciated nor justified), the continued effort of the government to maintain high prices of farm products and the failure of labor to produce at rates that would and could justify its high wages.

While prices may be expected to hold for a year or more around present levels, it will only be a question of time before the advance starts anew. There is too much politics in everything done at the national capital to enable us yet to hope that a high order of statesmanship may emerge from the present chaos to provide us with a more reasonable degree of stability.

The recent steel advances were a necessary compliment to the wage boosts. These new prices will not in themselves add more than 1% to the average cost of finished goods, but taken with the present labor costs in fabricating industries, they constitute substantial increased burden on the end user.

Wire for screws, springs and other products continues short and will be scarce until rod supplies increase; now not anticipated until the fourth quarter. Music wire has eased considerably. Fencing and nails continue tight, in spite of the fact that for the latter a record production of 865,000 tons is expected for 1947. Output of manufacturers and merchant wire is back to pre-July levels, the July slump of practically 50%, due to shut-downs, having delayed the expectation of an early second-half improvement. Low carbon heading, resulphurized basic and stapling wire are in strong demand. Aluminum baling wire, because of a bumper hay crop and a shortage of steel wire for this purpose is reported to have sold well, even at the higher price this metal commands. Demand for fine wire is good. Wire rope deliveries are now fairly prompt.

Copper had been increasing in supply to the point where ample supply and lower prices were shortly hoped for, but a strike threat against the big refiners may postpone an early balance between supply and demand. Brass and copper wire mills are operating at peak capacity and taking all the copper they can procure.

Zinc is still short in supply on Prime Western and Special High Grade, with most other grades in oversupply. Efforts are being made to equalize the disparity.

Lead, by one informed authority, is held to be improving so that a balance of supply with demand may soon be realized. While the war-years saw phenomenal consumption, 925,000 tons were used in 1946, as against 782,000 in 1940, indicative of a steadily improving status.

The general outlook, from a business standpoint, is healthy. Two years from now we may have to face further readjustments, but there is no reason to fear that these cannot be made in an orderly manner.

—from the Editor's Desk

you profit either way

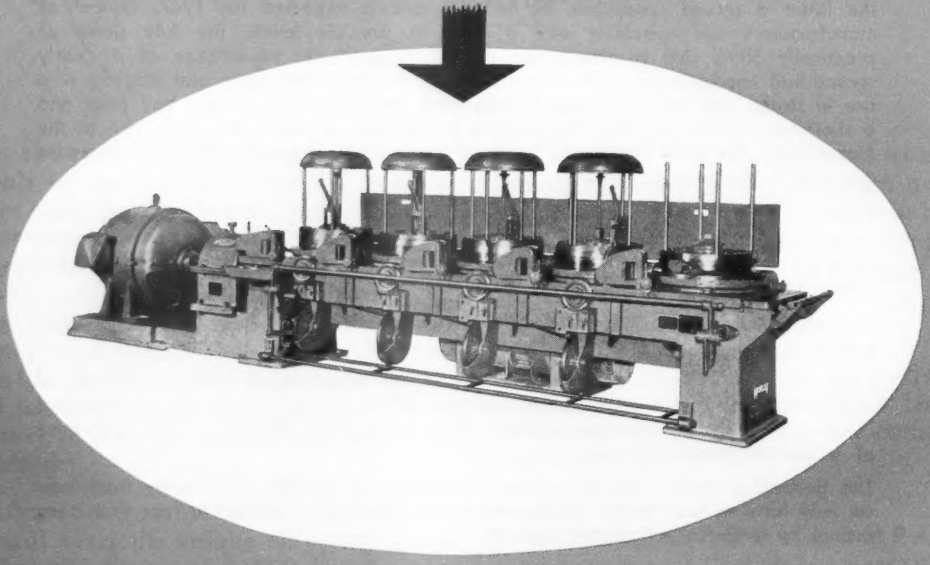
"We want increased volume to obtain the lowest possible cost per ton"

"We want more efficient operation based on our present volume"

with

MORGAN-CONNOR

WIRE MACHINES



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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 22 SEPTEMBER, 1947 No. 9

Designated as
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Contents

Editorial Page 647

Spencer Wire Company
Oldest Living Wire Mill in America
by Kenneth B. Lewis 651

Technical Progress in the Wire Industry
by R. S. Brown 658

The Aetna Wire Drawing Unit — Part II
by E. J. P. Fisher and
A. L. Thurman 665

Labor Relations
by John B. Stone 669

Government Wire Production Information 670

Outstanding Personalities of the Wire Industry 674

A Review of Recent Wire Patents 682

Index to Advertisers 696

Where-to-Buy 697-700

— ASSOCIATE EDITORS —
Kenneth B. Lewis, Consulting Wire Mill Engineer
Lancaster, Allwine & Rommel, Consultants on Patent Information

Richard E. Brown, General Manager
R. S. Spengel, Business Manager
E. D. Sickels, Advertising Manager

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Stevens Flanged Steel Traverses are manufactured in a wide range of sizes up to 56" diameter and 48" traverse...in plain, painted and hot dip galvanized finishes. The special "Reinforced Type" has *extra strength* where it is needed most—at bolt holes and base of the flange—yet saves weight through use of lighter gauge steel. Width of flange and number of bolt and drain holes are furnished to your specifications. Write for prices.

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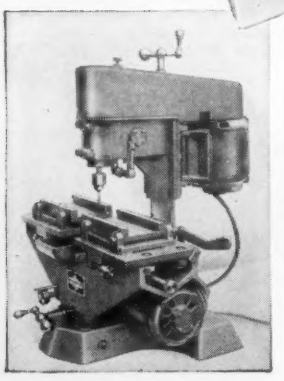

Firthaloy offers complete nail mill service—finishing equipment, *Firthaloy* experienced men for trouble-shooting and general nail mill service.

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WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 22 SEPTEMBER, 1947 No. 9

Spencer Wire Company
Oldest Living Wire Mill in America

By Kenneth B. Lewis
Consulting Wire Mill Engineer
Worcester, Mass.

An outline and history of the development of the Spencer Wire Company at Worcester, Mass. The fifth of a series of articles on the history of American Wire Mills.

WE have to stretch the truth a wee bit to justify the subtitle assigned to this story. The mill was producing wire commercially in 1812 and continued almost without interruption until about five years ago, and its name persists in the title of the Wickwire-Spencer Steel Co.

* * *

THOMAS Jefferson and his Secretary of State and successor Madison were in a fine mess a hundred and fifty years ago. England was slugging it out with Napoleon on the sea; Mr. Jefferson hated England and loved France. He would have liked to show his partiality in a practical way, in retaliation for the impressment of American seamen by the British navy, but it was notorious that the French navy was just as mean to us as the British. The fact is that they both despised us.

* * *

JEFFERSON thought up a scheme to punish both nations which did more credit to his heart than to his head. He decided to starve them to death by refusing to trade with them. The effect on England was exactly nil; France was disturbed to the extent of having to cultivate sugar beets. The effect on our own country, both immediate and long range, was terrific. Our carrying trade, whose practicioners had been the cleverest and most enterprising of our citizens, dropped dead, and they, both to supply the articles no longer available from abroad and to find work for idle hands, turned to manufacturing.

* * *

ONE of the sorely missed imports from England had been card wire. With the exception of the city folks, who constituted less than ten per cent of the population in those days, people sheared their own sheep, carded the wool, spun and wove their cloth, and made their own clothes. Every household had a set of hand cards, and for the townspeople there were a few textile plants and a few manufacturers of their simple accessories, such as carding engines, the machine driven equivalent of the hand card. The town of Leicester, half way between Spencer and Worcester, had become, through the enterprise of several of its citizens led by Pliny Earle, the center of the card making industry. Some of this was factory work but more was of the nature of cottage industry. **Earle & Chase** advertised that anyone wishing to set cards at home could be accomodated with the materials at their store at Main and Thomas streets in Worcester. Forty two cents a square foot was the going rate for first class work, and it may well be assumed that the embargo was unpopular in and around Worcester.

* * *

THE following letter from the firm of **Almy & Brown,** of Providence, found its way to Leicester in the year 1789.

Respected Friend, Pliny Earl. — We having pretty much concluded to alter and cover our carding machine, and Joseph Congdon informing us that he expected to go to Leicester soon, we thought we would inclose & send thee the Number & diameter of our Cylinders and propose thy covering them with Cards. — We are not desirous of beating thee down in price, or that thou should do it below what thou could reasonably af-

ford, but we have thought, considering that thou hast thy machinery now prepared, which was not when thou did that for the company at Worcester, etc., etc., etc. Even among Friends it seems the chisels were always sharp.

* * *

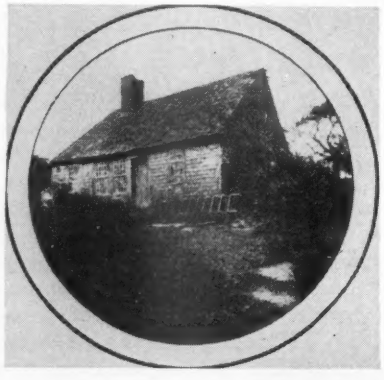
NO sooner did the pinch in card wire come than a number of experimental units sprang up around about Worcester. Leicester, Walpole, West Boylston, Barre, and Phillipston were all represented, but the only one that survived the experimental period was the unit in Spencer which grew out of trials in the home of **Jacob Watson**, where wire was drawn by hand out of two small tubs. On Seven Mile River in that town there was a good water power on which **James Watson** had built a mill in 1740, and here **Charles Watson** and **Windsor Hatch** began the commercial production of card wire in 1812. In the same year **Eliot Prouty** established a wire mill lower down on the stream. Both enterprises flourished in their small way, and even though the resumption of trade with England must have bothered them, for the cold-blooded card makers shifted their allegiance as soon as circumstances made it profitable to do so, the year 1820 found these two mills well established.

* * *

IN 1820 the upper mill came into the hands of **Messrs. Biscoe.** In 1847 an English immigrant named **Richard Sugden,** who had been a wiredrawer in the old country, formed a partnership with **Nathaniel Myrick** and took over the business. In 1870 the firm of **Sugden & Myrick** took over the **Prouty Wire Co.,** the business set up by **Eliot Prouty** in 1812, at "Proutyville" down the stream, and six years later the combined operation was incorporated as **Spencer Wire Co.** The original holders of the 600 shares, par value $100., were Richard Sugden, Jonas Prouty, Joel Prouty, Charles Denny. J. H. Goddard, Alex Milne, Philip Moen, and Charles Washburn. Note the appearance of Washburn and Moen; there was for many years a link of this sort between the two oldest wire enterprises, Washburns, Moens, and Goddards were to be found on both boards.

Harry W. Goddard, last president of Spencer Wire Company * * * * *

NOW let's take a quick look at the old mill and try to figure what went on there, in the early days. There's nothing harder than to pry out of the records any hint whatever of drawing practice; I have been at it for years in many languages and many periods and the pickings are pretty slim, but like the naturalist who can look at a fossil leg bone from pre-Cambrian limestone and describe the extinct beast to whom it once belonged, I have developed extra-sensory perceptions in these matters and I can paint a fairly accurate picture of the processes which the owners tried so hard to keep under their hats. I had the good fortune to stumble on a half column in an issue of the Aurora, a Philadelphia newspaper, of Feb. 14th, 1812,



This building was erected in 1810 as a wire mill, but on acount of the depression following the end of the war it was transformed into a dwelling. * * * * *

in which a man who had drawn wire during the American Revolution described the process and urged true-hearted Americans to establish wire factories and cast off the shackles of perfidious Albion. From this and from contemporary accounts of British and French practice I can get a fair amount of data.

* * *

THE raw material was a billet of wrought iron, which was forged down under a trip hammer to a bar somewhere near 1/4" diameter and about ten feet long, generally two to four pounds weight. Several ways of roughing this bar down are indicated in the line drawings, which are from a treatise published in 1826 and which, if they are as far out of date as most technical books of the period, probably cover 1812 very neatly. The flat belt bench was a favorite, except in cases where a good water power was at hand, in which case the bell-crank method was often used, with the crank depressed by cams on a wheel-shaft and brought back by springs which consisted of tough saplings. Straight-out drawing was carried along down to about 16 gauge, when drawing was shifted to the hand cranked intermediate block, and the final drafting was sometimes done on geared blocks as shown. Plenty of this finishing work, however, was hand work; gears were new and not considered efficient.

* * *

SO much for the outline, now for some details. Nothing is ever said about the source of the iron. I wonder if it was a local product. Bog iron ore was being smelted in the Brookfields; Five-Mile river was dammed to back up a mill pond and create power for a forge. The dam now constitutes the state road through East Brookfield, and the pond, first called Furnace pond, is now Lake Lashaway. Warning is often sounded that only first quality iron will do for fine wire, and that irregular metal will have to be dropped out at a coarse size. Sounds familiar. The trip hammers referred to generally were actuated by multiple cams on a wheel-shaft, and hit up some high speeds. Before rolling mills ousted them, they

were working fast enough to turn out wire rods forty feet long. The product of the hammer was sometimes passed through a pair of rolls with a single groove, to perfect the degree of roundness and help crack off the scale.

* * *

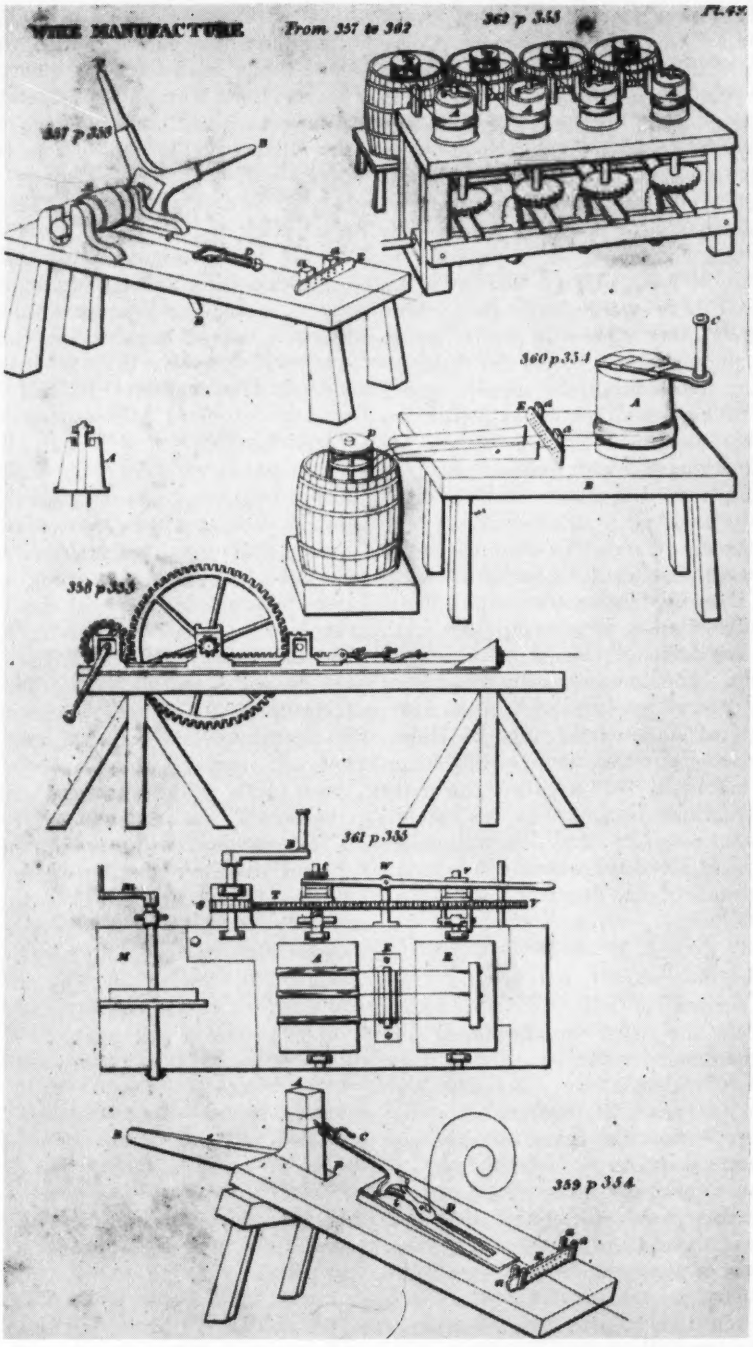
AS for the scale, acid pickling was many years ahead; it did not begin to creep in until about 1850. Scale was often scratched off with half-bricks, and from process wire with a rag or scrap of leather wetted and rolled in sand, but an alternate practice was just to ignore it, to let the die scrape it off! Remember the rod was only ten feet long, and nothing much could happen in so short a length. Remember too that the rod was pinched by the tongs every few inches and the character of its surface was nobody's business since it was only a semi-product. It must be borne in mind all the time, in assessing these old practices, that wire meant fine wire, there was no market for the coarse sizes. There are warnings against annealing in such a way as to get too much "oxydate," which, it is said, causes black streaks on the wire and sometimes breakage.

* * *

THIS we can well believe. Something rather advanced in annealing is described, the packing of wire in closed vessels whose covers are luted on with clay. This greatly reduces the oxydate. One way to cope with these black streaks is to soak the wire in any one of several "menstrua" of an acidulous nature, such as sour beer, or the liquors collected around the base of a charcoal distillery. Probably many old-timers reading this account will have discovered, as I did, that a good soak in the rye-meal liquor, of fragrant memory, would do a very fair pickling job. One radical of the times says he treats the wire in a vessel in which he boils water in which there is some "tartar."

* * *

THERE is a detailed description of the making of dies. They were the type now extinct, with soft back and hard face. The backing



Standard wire equipment in 1812.

* * * * * *

was a bar of wrought iron with one side deeply scarred with chisel cuts. For the facing you must melt pot metal, cast it on an iron plate, crack it up, remelt, and so on for about fifteen cycles so that you arrived (although the old accounts didn't know this,) at a hyper-eutectic steel, probably about 2% carbon, all combined. This was to be cracked up fine, wetted, plastered over the scarred face of the iron, the whole wrapped in cloth, dipped in clay and baked, and finally heated repeatedly to a good high heat and gently hammered until the two metals diffused into each other. Not bad.

IN the matter of drafting, every man was his own expert. There were no definite sizes, except some vague gauge referred to by name rather than number. For instance, Big Nogg and Little Nogg were two sizes often mentioned but never defined. With weak scaly wire and informal lubrication, drafting was necessarily light; it is possible to deduce, from a large mass of data, that there were more than three times our number of drafts to go a similar distance. As for lubrication, most accounts simply ignore it. Some mention tallow, with no suggestion as to the method of application, but our Philadelphia patriot says he always laid a cloth saturated with tallow across the running strand. The fine wire was drawn out of tubs of sour beer, a lubricant in its own right. Anything that is fermenting will both pickle and lubricate steel wire. Sour beer was in use by **Washburn & Moen** as late as about 1870, perhaps much later. An old white-haired fine wire man with whom I talked in 1907 recalled the more convivial operators of his youth, sometimes, in the desperation of a blue Monday, taking a hair from the tail of the dog right out of the reel tubs.

* * *

A man simply felt around from hole to hole till he found a draft the wire would stand, and he annealed when he couldn't draw any further. The rules for high carbon were the same as for low, except for the acknowledged fact that the drafts must be lighter and the annealings more frequent. Patenting was still forty years in the future. Card wire from **Spencer** was of wrought iron, drawn without a copper coat, as this was a much later discovery, straightened by hand through iron pegs on a board, and shipped in two to four pound bundles. A contemporary states that the loss from billet to product, chargeable to scaling, shorts, and miscellaneous griefs, was 25%.

* * *

THIS mill at Wire Village grew to a sum of over twenty buildings. The output, which in 1845 had been sixteen tons valued at $8000., reached twenty five hundred tons of a value of three hundred thousand dollars some seventy years later. It was almost unique among wire mills, there being only the **Gilbert & Bennett** mill to compare with it. The buildings are located on one road along the narrow valley of Seven Mile River, and on the feeder roads taking off up the steep hills are the cottages of the workers. It is neat, it is remote, there is an oldworld flavor about the whole set-up that is striking indeed. The nearest town and railroad are several miles away. The superintendent of this mill lived like a patriarch among his subjects dispensing the high, the low, and the middle justice with scarcely any regard for the world beyond the hills. I have seen nothing quite like it except for some of the little crack-in-the-mountain declives of Germany, like Altena. Wire Villagers were an informal clan by themselves; few came, fewer went, five generations of mill history were not unique in a family, of which three often worked side by side.

* * *

THE equipment was by no means as primitive as the surroundings, although there was a saying some years back that when there was a decision to build a new bench the first thing to do was to cut down a tree. The equipment was fairly good, of its class, that is, up to the time it was definitely decided to let the old mill run down. Wire Village never fully yielded to the fine wire continuous machine, and was the last place where one could have the stimulating sight of a half-acre of 8″ blocks absolutely untended, running out at night.

* * *

RICHARD **Sudgen** lived to be eighty, and was active to the last. At his death, in 1895, the mill was bought on easy terms, according to a long-standing agreement, by **Harry W. Goddard,** who had started work for Mr. Sugden in 1880 and been office boy, shipper, teamster, and general handyman. He continued to head the company as President and Treasurer until its merging into **Wickwire-Spencer.**

HARRY **Goddard** was of a wire making family in the third generation. It was his grandfather, Benjamin Goddard, who teamed up with Deacon Washburn to start wire manufacture in Worcester. His father, Dorrance Goddard, was for many years superintendent of the Quinsigamond Mills, later South Works, where Harry worked with him three years before going to Spencer with Mr. Sugden. Dorrance was a restless type; he and William E. Rice started a mill in Holyoke, sold out, and Dorrance lost the money in an abortive mill venture in Worcester. He followed the forty-niners to California across the plains, in fact he made no less than twelve trips to California, by covered wagon, around the Horn, and across the Isthmus, to say nothing of three trips to Alaska in a day when Alaska was more remote than the poles, always returning to Washburn & Moen. But after his last Alaskan trip he settled in Spencer and served as superintendent in the Village mill under his son, until he retired in 1900.

* * *

IN 1899 **Harry Goddard** and **Bruce Dunn,** nephew of Richard Sugden and clerk of the corporation, bought a tract of land in Worcester on Webster Street and erected a new wire mill. The Wire Village location had weaknesses which became intensified with each passing year. Along about the decade 1850-1860 a change came over the wire industry which could justly be called a revolution. It was paced chiefly by the electric telegraph, whose adoption and rapid spread made a market at long last for longer pieces of wire in coarse gauges. This pressure led directly to the continuous rod mill, and to heavy bundles which were of sufficient length in coarse gauges to warrant the use of rotating blocks for the break-down. This in turn made available coarse wire without tong marks, and opened one market after another, such as nails, fence, and bale ties. Bessemer and open hearth steel came piling in on top of these advances, each of which stimulated the others, and before you could say Consolidated Edison, there was

a wire industry of heroic proportions.

* * *

IN this new market the little mill at Wire Village was ill fitted to play a role. It was quite literally a horse and buggy mill. It could do well with the fine wires, for they ran more to labor than to tonnage, and the fact that every pound of product had to make two trips on horse drawn trucks was not too serious. The special skills, possibly inherited, certainly whispered from father to son, and kept pretty safely in the Village, gave the mill an edge which wiped out the transportation cost. But the world was changing; a big coarse-wire market was opening up, in which the Village would start with two strikes on it. **Harry Goddard** intended to get himself a piece of that market.

* * *

MR. Goddard was either very fortunate or very clever in the choice of associates and subordinates. In fact, the story of his success is merely a recital of the names of these associates and their contributions. Having been only an onlooker, and by no means a close or observant one, I am ill fitted for the task, and I am certain to leave out two for every one I recall, but a start must be made.

* * *

THERE is very little I can find about personnel at the Village. The names Johnson and Stockwell seem to have been associated with the mill, and Dorrance Goddard worked there for his son in the late nineties. About 1900, apparently upon the retirement of his father, Mr. Goddard got a Mr. Theobald from Cleveland, who carried on into the early twenties, at which time he was succeeded by a local boy, Percy Andrews. Percy, who is better known around among the mills than other villagers, left about 1927 to help John Wheeldon with his mill in West Brookfield, and upon the extinction of that enterprise shifted in 1929 to the superintendency of Worcester Wire Works, from which he has recently retired. He is as vigorous as a wildcat, but tells me that the ghastly state of labor relations nowadays was gradually working mischief with his blood pressure. When Percy left the village, the job fell on the shoulders of Arthur Vandall, who held it until the Village mill suspended operations.

* * *

I am well aware that I have run over the line into the **Wickwire-Spencer** story, but while I have these names before me I am going to run them down very briefly to the present. One reason is that as I get further into the Wickwire-Spencer saga I am appalled by its complexity and realize that I may never have the nerve to tackle it.

* * *

THE new mill in Worcester had scarcely opened its doors before Lady Luck began to smile on it. **Frank Kilmer** had gone to work for Morgan Spring Co. at their new Barber's Crossing plant upon his graduation from high school in 1896. He shifted to the new **Spencer Wire Co.** in 1900 and served about 25 years, much of the time as asst. treasurer. It was about 1925 that he and **George Thompson**, both of whom took a rather dim view of prospects under the Wickwire regime, took advantage of the shift of headquarters to New York, and, to make a long story short, took a powder. **George Thompson** went to Boston and started the **Thompson Wire Co.** as a flat-wire mill, and later opened the round-wire mill which operates under the same name in Worcester. Kilmer put some money into a new project which was at that moment desperately in need of capital and counsel, and ultimately joined its staff. This was **New England High Carbon Wire Co.**, organized by **Carl Lund** in 1925.

* * *

IN 1902 **Winthrop Hall** joined the staff on Webster Street and worked for **Spencer Wire** and its successor over twenty years. Win. was a wire man on both sides of the family. He was a grandson of Dorrance Goddard, a great grandson of Benjamin Goddard, and on the other side of the tree had a father and grandfather who had spent their lives with Washburn & Moen. The grandfather, Elbridge Gerry Hall, millwright at the South Worcester plant, met his death in a mill accident. The father, Charles Stearns Hall, was at South Worcester till the fire of 1867; he was moved to Grove St. then, and utimately became assistant superintendent under the well-known Charles Hill Morgan. Mr. Morgan's interests lying along the lines of design and construction, Mr. Hall was responsible chiefly for practice and production. At **Spencer Wire Co. Win Hall** was active in both engineering and administrative work and served as a director.

* * *

IN 1902 **George Thompson** joined the company. He was a Washburn and Moen boy who had stepped out a few months previous to start, in company with J. D. Crosby and two others, a small mill in Charlton which withered on the vine. Just what circumstances brought him in contact with Mr. Goddard I do not know, but there is no doubt that the purpose of the association was to get the new mill into high carbon wire, which they both recognized as a gold mine and in which the big mill at the other end of town was cleaning up. One of Thompson's first acts was to lay siege to **Oscar Johnson**, of North Works, the head of the department of music wire, a man of growing reputation as an expert in that field. Johnson made the transfer, and **Spencer Wire Co.** got deep into high quality wire.

* * *

SEVERAL others made the shift at or about this time, and under the same influence. One was **Dave Johnson**, who, with his brother **Ben, (Bernard)** followed their father from Grove Street. Dave and Ben some years later had the courage and audacity to build a little wire mill with their own hands in secret, in the end of a building reputed to be a hen-house. They actually made sales contacts and got the mill started before they were detected; they went on to persuade their father, **Oscar Johnson**, to bring to their enterprise the prestige of his name, they prospered, they built a bigger mill, now known as **Worcester Wire Works**, lost it, and finally built the **Johnson Steel & Wire Co.** That story deserves an article of its own.

OTHERS came from Grove Street. **Allan Copperthwaite,** a flat-wire expert, came over and started Spencer Wire in that line. Later he went to Boston with George Thompson. **Ed Parker,** a wire rope man from New Haven, where he had worked for A.S.&W. Co. in their plant which had started life as the **New Haven Wire Co.,** and who, I faintly recall, was a Waterbury Rope man before that, and later went to Upson-Walton, came over and got them into wire rope. **Al Lundquist** came over, grew up under Oscar Johnson in the music wire game, and later became superintendent of George Thompson's Worcester mill. He is now retired.

* * *

THE Johnson affair, culminating in the loss of the elder Johnson, was a shrewd blow. Metallurgy was not quite the exact science we know, and the names of a few practical experts who had an instinct for wire quality were all-powerful. Harry Goddard's infallible judgment was still clicking when, in 1917, he secured **Dwight Granger** from the **A.S.& W. Co.** to span the gap. Granger, who had joined the staff of Clinton Marshall on leaving Harvard in 1906, had developed into a triple-threat man, management, metallurgy, or merchandising, he was ready and competent to tackle problems in any field, and was so used by his superiors. At the time in question he was acting as superintendent of the fine wire department, where, I am willing to bet, things had been going badly. Throughout his whole career he has functioned as a roving center, always ready to back up a weak spot in the line. I have seen him serve **Wickwire-Spencer** as coordinator of practice, metallurgical authority of last resort, district manager, treasurer and operating head of the wire fabrics division in Pennsylvania, general trouble shooter. I have noticed that his office was always within easy back-door range of the office of the operating head of the corporation. At the time of his retirement last January (1947) he was affiliated with sales; just previous to that assignment he had operated the **Wickwire-Spencer Metallurgical Corporation,** a subsidiary dealing with lamp filament and similar unusual problems, and the refining and fabrication of several of the rare metals.

* * *

JOHN Wheeldon came to **Spencer Wire Co.** about this time. John was an old A.S. & W. man, of rod mill origins, who was engaged originally to survey the prospect of installing a rod mill for the independent producers of the district, and became general superintendent. He continued in that role for **Wickwire-Spencer** until the mid twenties, and when he was blown out in one of the upheavals of the times he started the **Wheeldon Wire Co.** in **West Brookfield.** There he surrounded himself with a circle of "graduates" of the constituent plants. **Charley Sparrell, Clarence Arms,** (now superintendent of Thompson Wire,) **Percy Andrews,** and others. John died suddenly one night, after helping to fight a small fire at the mill, and the enterprise did not long survive him. It was bought by **Seneca Wire & Mfg.** Co. of Fostoria, Ohio, for whom **George Matthews** ran it for a brief period and then shipped the best of the equipment to the parent plant.

* * *

WHILE I am in West Brookfield I will run down the last trail. The Wire Village mill, closed about 1930, was reopened a few years later by a Mr. Harris, closed, and reopened by **Messrs. MacDonald and Wood.** After a few years they closed it again and transferred their activities to the Wheeldon plant in West Brookfield, where they are now operating under the old name, **Spencer Wire Co.**

* * *

ONE of the more successful of the Spencer Wire recruits was **Paul Macklin,** a school teacher who came into the mill during the acute labor shortage of the first World War and rose like a rocket to become vice president in charge of operations for Wickwire-Spencer, the position he held at the time of his tragic death on a hunting trip. Others are simply too numerous to mention. I recall **Con Reidy,** everyone's friend. who came over from Central Works to take charge of wet wire when **Ed Hobart** came over to become the first superintendent on Webster St. **Charley Werme** came from North Works, rather early, I should say about 1911. It is hardly necessary to mention **Bill Bennett;** his services as alderman and mayor are fresh in everyone's mind, and he is now sheriff of Worcester County. **Fred Lees** had a long record in both plants. **John Couming** followed **Granger** from North Works, as did many others of whom I have no record. Many will recall **Harry Johnson,** a sort of Paul Bunyon, whose feats of tonnage as a wire-drawer were legends in two mills, **Morgan Spring** and **Spencer Wire,** and who became known all over the country after I took him on as demonstrator and tuner-upper of Morgan-Connor machines.

* * *

BILL Buck left a host of friends when he migrated to Buffalo with the machinery for whose condition he had been so long responsible. **Charley Hardy** is as well known in wire sales circles as was old **Frank Baackes.** He broke in at Washburn & Moen, shifted to Spencer Wire, went with Carl Lund in Millbury, and finally joined George Thompson's new venture on Stafford Street. **George Palmer,** who was long in charge of Worcester Wire Works, started as a Spencer man, as did also **Arthur Carlson,** who served a term at Worcester Wire and went from there to his present berth with Washburn Wire Co. in New York.

* * *

THE **Clinton-Wright Wire Co.,** made up of **Wright Wire, Clinton Wire Cloth, Morgan Spring,** and the latter's subsidiary **National Mfg. Co.,** was finally incorporated in June of 1919. Mr. Goddard was pressed to come in but he declined. His plant was badly needed to round out the new corporation, and the pressure was never relaxed. Wright Wire was a valuable property, but **Spencer** was a gold mine. The merger had an excellent position in the fabric market, and **Wickwire Steel Co.** was scheduled to come

(*Please turn to page* 695)

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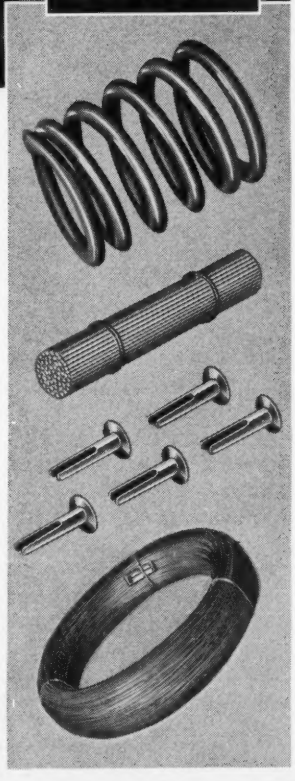

SPRING WIRE · ARC WELDING WIRE · FORMING WIRE · LOCK WASHER WIRE
CHAIN WIRE · TUBULAR AND BIFURCATED RIVET WIRE
WOOD SCREW AND MACHINE SCREW WIRE · GALVANIZED WIRE

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

Technical Progress in the Wire Industry

By R. S. Brown, Esq., Chief Metallurgist,
Rylands Brothers, Ltd.
Warrington, England

The Presidential Address to the Manchester Metallurgical Society, also presented before the Start School of Frederick Smith & Co., Halifax, England. Introductory remarks by Mr. Peter Smith stated:

Mr. Brown originally prepared this lecture as his Presidential address to the Manchester Metallurgical Society. The interest created was so profound that it became evident that the Wire Industry would be missing a substantial contribution to its progress if arrangements could not be made for a second presentation before those actually engaged in wire manufacture.

It is one of the more encouraging trends of our time that it should now be possible, to some extent, to share technical information within a Trade previously renowned for its policy of secrecy. It is noteworthy that Mr. Brown, the Author of today's paper, should be a senior member of the Staff of one of the largest wire producing Companies in the world and, therefore, able to present a review of technical progress more thoroughly than would have been the case had his field of activity been more limited. Perhaps, however, encouraged by this example, other wire producers may see fit to add their contributions to the Technical and Administrative knowledge of our Industry.

WHEN the Author entered the Wire Industry in Warrington some 32 years ago, technical knowledge of processes was deplorably lacking. One or two valuable papers, notably by **Longmuir** and **Goerens**, had appeared, dealing with the somewhat specialized heat treatment with which we are familiar, but generally such scientific knowledge as had been obtained was cloaked with the secrecy traditional to wire manufacture. There was, of course, at that time a valuable background of metallurgical and metallographic knowledge to be drawn on by the curious investigator, but little of this had had any influence on wire production.

* * *

OPERATIONS in these large wire mills, founded in Warrington in 1805, were in the hands of practical men who by their native ability had absorbed the lore of their predecessors, which served as the basis for production methods. However excellent this arrangement may have seemed at that time, it suffered from the serious defect that any development was of necessity of an ad hoc nature and progress was, therefore, slow and painful. I think, therefore, you will be interested in tracing with me some of the steps which have proved instrumental in raising the manufacture of wire from the position of an age old craft into one of technical enlightenment and I think we might consider first the slow development of wire manufacture throughout the ages in order to appreciate the impact of scientific knowledge on process development during the past few decades.

* * *

Thanks are due Messrs. Rylands Brothers, Ltd., for permission to publish this paper together with the photographs of the plant.

ALTHOUGH iron and its offspring steel have been introduced into the wire industry comparatively recently, our forebears were skilled workers in the manufacture of wire from copper, bronze, gold and silver. The earliest known wires, discovered by **Petri** in **Assyria**, are believed to have been manufactured as long ago as the year 4,600 B. C., but it is probable that at this time production was by means of hammering. However, in the year 4,000 B. C., the Egyptians learned to draw silver wires through holes in hard wood and possibly precious stones in order to remove the hammer marks. In the year 3745 B. C., a crown was made of woven wire for **Queen Schubab** of **Samaria**, which contained a stranded gold filament made up of wires of .010″ and .012″ diameter. It seems reasonably certain that wires of this small size could only have been produced by pulling through minute holes in some hard substance.

* * *

THE history of wire until the Middle Ages is associated with non-ferrous metals and the early steps in the development of wiredrawing plates and dies are lost in obscurity. It is certain, however, that in the year 1260, cold drawn wire as we know the term today was being produced in quantity in France. In 1351, **Rudolph of Nuremburg** applied the water wheel to the manufacture of wire rods and records of the same period mention the word "drawer", indicating that these rods were being pulled through dies, whereas previously the wiredrawer was known as a "wiresmith". A water driven mill of Rudolph's time is shown in Fig. 1. Prior to this, and probably continuing for a long time, the wiredrawer or wirepuller used an arrangement similar to that shown in Fig. 2. The wiredrawer sat on a swing which enabled him to grip the wire and pull it through the die with an oscillating motion in reasonable comfort. It is interest-

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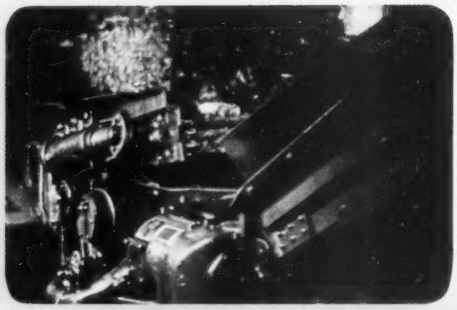

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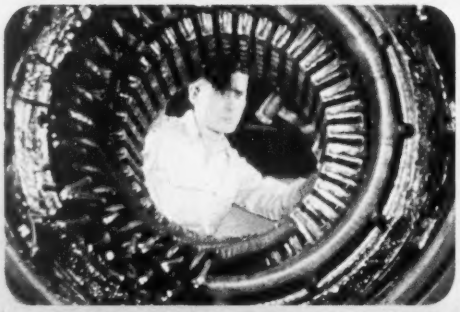

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ing to note that during a recent visit to Germany, identical methods were found to be still in use, but confined now to pulling the wires through the die preparatory to attaching to the block.

* * *

IN searching for information on early wire history, I found an entry in the Town Record of Coventry for September 14th, 1435, which reads as follows:

"Sir, I had of you of late bad wire; Sir, amend your hand or in faith I will not more buy of you."

* * *

OBVIOUSLY times have not changed very much, since we still suffer from the same sort of complaint but couched in modern and perhaps less dignified commercial phraseology.

* * *

Plate and Die Drawing

SO much for the early days; I must now pass on to times within our own ken. Wiredrawing as I found it comprised pulling wire rods, after first removing scale by pickling, through tapered holes in plates of high chrome steel by means of rotating blocks arranged on long benches. They were coupled by bevel gears to a main shaft, the motive power being provided by large mill engines, coupled by devious means to the various shafts arranged in a most amazing fashion throughout ill assorted shops. The wiredrawer was solely responsible for preparing the hole in the plate, which was punched out hot and subsequently worked up cold by tapered tools which he manufactured and heat-treated himself. The skill of the wiredrawer was, therefore, largely confined to the knowledge of tool making practice, a secret which he very jealously guarded. It was once common for the wiredrawer to grind his punches in his back yard and when the family had gone to bed he sat down by the kitchen fire and performed what was then the mysterious rite of hardening and tempering. You can well imagine the curious beliefs that existed regarding the precise properties of certain quenching fluids and it was not very difficult to alter this state of affairs.

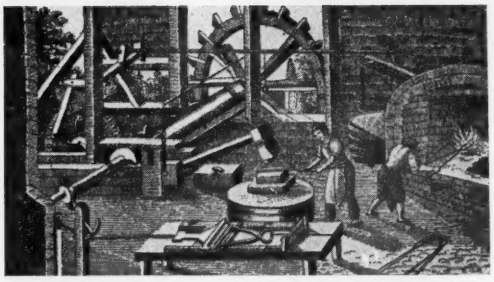

Fig. 1 — Early Water Driven Wire Mill. * * *

Fig. 2 — Swing Wire Puller. * *

* * *

CONSTANT cold hammering was undoubtedly beneficial in cold working the contour of the hole but it was difficult, despite this fact, to obtain more than two or three hundredweights of wire through a given setting without the hole having to be reset. This was carried out, in the early stages, by cold hammering round the exit of the hole, but a stage is reached when extreme cold work would cause small cracks to develop and prior to this the plate was hot battered round the hole, the plate being first heated to a temperature in the region of 650° C. The constant hot and cold battering produced the familiar sounds of the old wire mills, the loss of which I think is rather sad, as it was, at one time, like music to our ears. A radius cone was extremely popular at one time, but in the subsequent development of the tungsten carbide die it was found to be an unnecessary complication and, in fact, militated against the heavy reductions per draft now in force.

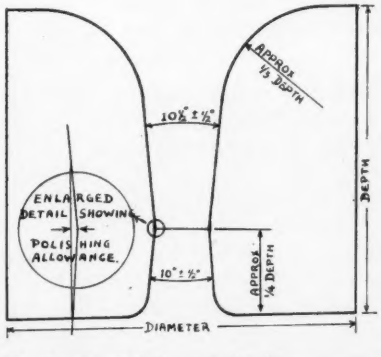

Fig. 3 — Standard Form of Die Nib. * *

* * *

THE advent of the **Tungsten Carbide Die** in 1926, as is well known, brought about a complete revolution in wiredrawing methods. Up till this time, wire was drawn mainly in individual stages, the coil being lifted from the block and put back on the swift for drawing again through a smaller hole, (Owing to limitations of die wear, the reductions were comparatively small, amounting to some 25% in area for mild steel and 20% or less for the harder high carbon patent steels.) For mild steels in smaller sizes, a continuous wet lubricated method was extensively used, the wire being reduced in area 20 to 30% per pass. For single holing methods, soap was pre-eminently the best lubricant but in the continuous method soap, for some reason, seemed rarely to have been applied and the lubricant consisted of a foul smelling mixture of barm, flour, tallow and rape oil, all boiled together in water to which some sulphuric acid was added. An essential feature of this process was, however, a copper coating applied by dipping the coils

Fig. 4 — Steam Powered Mill, Circa 1880 * * * * *

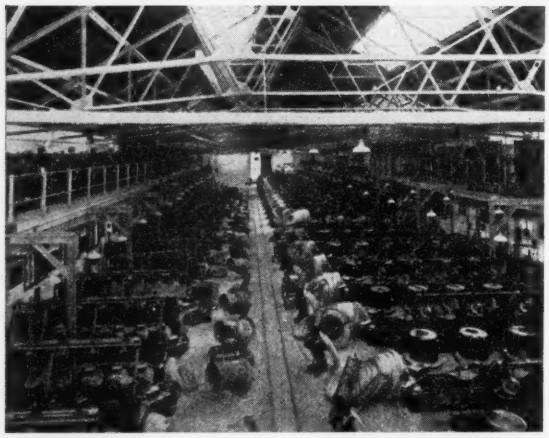

Fig. 6 — Mild Steel Wire Mill Constructed 1933. * * *

in copper sulphate solutions, usually inhibited with barm, which produced a firm, bright, dense deposit. Some copper sulphate was also introduced into the intermediate lubricating box to maintain a good copper film. One of the surprising features of the wet method and one which has still not been explained, is the fact that hydrogen embrittlement, at one time so common in pickled mild steel wires, was always entirely absent in these copper coated wires; so much so that baking ovens which were a common feature of wire mills of this time, were not usually provided for wet mill practice. It would appear that in this case the copper film selectively absorbs the hydrogen and it is known that copper wire can be left for prolonged times in dilute acids without suffering from hydrogen embrittlement and the copper film must, therefore, act as a hydrogen barrier.

* * *

Fig. 7 — Microstructure of 13 SWG Mild Steel Wire, Carbon 0.12%. x 250. * * *

Fig. 5 — Mild Steel Wire Mill Constructed 1932.

THE wet method was slow owing to poor lubricating conditions and constant replacement of steel plates, with the consequent stoppages for setting up, seriously affected the efficiency of this process. The Tungsten carbide die altered all this and although it was first applied to wet drawing methods, it was rapidly discovered that soap drawing could be applied to these fine sizes and ultimately wet drawing suffered its demise in our own mills in 1938. The method is, however, still utilized for producing special coppered finishes for stitching wires and the like.

* * *

THERE is no such thing as an ideal die form, except in relation to particular work a given die has to perform. Much research has been applied to the production of suitable die forms and a well balanced die for heavy operations on mild steel is shown in Fig. 3. There has been much discussion amongst practical wiredrawers regarding the value of a parallel portion, but our own work has shown that better results are generally obtained when this is to all intents and purposes non-existent.

* * *

Changes in the Wire Mill

THE developments in wire mill equipment during the past 15 years has been of a startling character. Fig. 4, for example, is a picture of one of our old mills for drawing mild steel wire, which has only recently gone out of commission. In contrast, Fig. 5 shows a mill developed in part to replace it as long ago as 1932. The elaborate requirements of a still later mill, Fig. 6, emphasizes the tremendous advance consequent on the development of tungsten carbide dies and there is no need to stress the great advance in wiredrawing speeds which these dies have made possible.

* * *

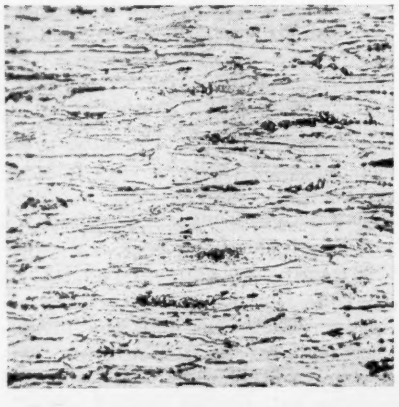

Fig. 8 — Microstructure of Mild Steel Wire, Carbon 0.06%. x 250. * * * * *

IN mills of this character, wire is today produced by standardized methods based on research experience and it is possible for the works organization to prepare weekly schedules of production yieding very large quantities of wire accurate to predetermined physical properties and with a minimum amount of rejection.

* * *

Mild Steel Wire

IT was, in the early days, the practice in reducing mild steel to 20 gauge or thereabouts, to introduce two or three annealings in order to reach the final size without the wire breaking during drawing or becoming useless due to poor properties in the finished condition. It was soon appreciated that much of this costly annealing was unnecessary, as it depended in large measure on the nature of the steel at that time available to the wire mill. Mild steel, at this time, was not normally manufactured below 10% carbon and the hetrogeneous nature of the resultant microstructure of the wire could be shown to have a serious affect on ductility. A photomicrograph of one of these wires in the overstressed condition is shown in Fig. 7.

* * *

COLLABORATION with the steel plant eventually saw the production of steel of substantially lower carbon content and steel making practice was ultimately standardized so as to produce large quantities of what we know today as fully trimmed steel, the carbon content of which rarely exceeds, .08%. The microstructure of a fine wire drawn from this type of steel is shown in Fig. 8. As a result of this development in the manufacture of mild steel for wiredrawing, it was possible to develop 8-hole continuous machines of the type shown in Fig. 9, such machines being capable of drawing 5 gauge rods to 22 gauge wire without difficulty.

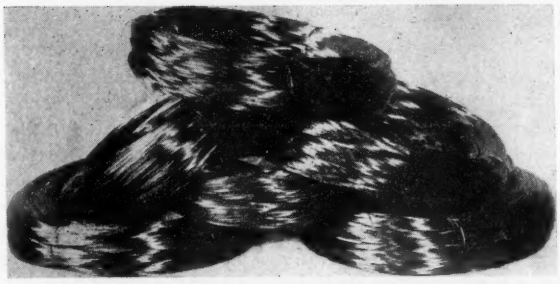

Fig. 9 — 8-Hole Continuous Machine, 5-22 SWG. * * * *

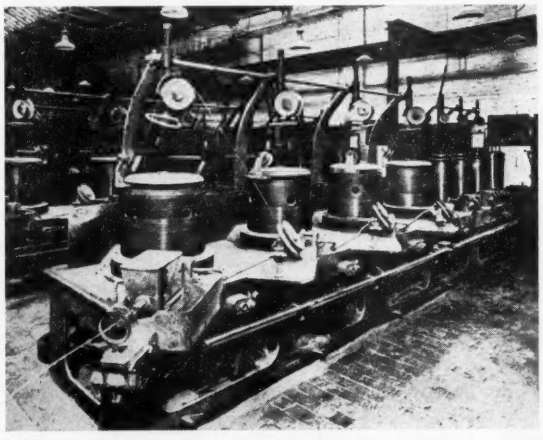

Fig. 10 — Experimental Bell Type Bright Annealing Unit. * *

Annealing

ANNEALING of wire in coil was carried out in large cast iron or cast steel pots placed in coal or producer gas fired furnaces, usually situated below ground level. The pots were closed by lids which were usually luted, but nevertheless scaling was quite pronounced, which involved pickling and drying prior to subsequent drawing operations. The conditions in the old annealing shops can only be described as approaching those of Blakes "Dark Satanic Mills". The extent of the metallurgical knowledge at this time can be gauged by the fact that annealing was regarded as something in the nature of baking, and that if softer wire was wanted it was necessary to double and treble the normal soaking times. An annealing shop foreman solemnly told me 30 years ago, that annealing consisted of burning the sulphur from the steel and he proved this by demonstrating the blue flame which always poured out of the sight hole in the pot lid when the pot was withdrawn from the furnace. The flame was, of course, due to the combustion of the gas formed from the incomplete combustion of the lubricant on the wire surface.

* * *

ABOUT this time, we were seriously troubled with excessive grain growth in mild steel for cold heading and chain making purposes and this was ultimately found to be due to the development of **Steads** brittleness arising from the then usual light draft from the rod preparatory to annealing operations, which was a simple matter to arrange for all rods or wire to be drawn by a minimum of 30% reduction prior to annealing operations, which completely cured the trouble. It is to be feared that much brittleness in mild steel wire in the good old days arose from this source

Fig. 11 — 24 SWG. Bright Annealed Mild Steel Wire. * * *

which has now, I think, almost been forgotten.

* * *

THE search for more precise methods of control, both of the physical properties of the wire and the conditions of the surface, lead to the ultimate development of the inverted or bell type furnace, using prepared atmospheres. Fig. 10 is a photograph of a shop laid out for experimental work with annealing processes. In the centre of the shop is what I believe to be the first bell type furnace and auxiliary equipment to be installed in a British Steel wire mill. Prior to the introduction of this plant, bright annealing was obtained by the time honoured method of surrounding the coils in the pot with cast iron borings, a slow, expensive and not always satisfactory procedure. The first bell type furnace was equipped with a burnt town's gas atmosphere, but experiments were soon commenced using cracked ammonia, either wholly or in modification of the burnt town's gas. One or two disastrous explosions occurred when using both these atmospheres and it was not uncommon for the light heat-resisting steel bells to be projected through the roof, possibly a precursor of the rocket projectile. The search for a non-explosive atmosphere finally lead to the introduction and development of the regenerative cracked ammonia burnt hydrogen system and composition limits of explodability were determined prior to its introduction on a large scale. Fig. 11 shows an example of what is now possible from a plant of this nature, the wire being for glass reinforcement. It is now standard practice to anneal for drawing to fine sizes without intermediate pickling.

* * *

Patent Steel Wire

I would like to touch very briefly on the development of this product, which is probably the highest class of wire produced in the industry. Apart from the very high tensile strengths involved in the finished product, other properties such as high bends, good torsion values and above all sound performance in wire ropes, springs, motor vehicles tyre beads and the like, demand an exceedingly close control of all stages of manufacture. Early patenting furnaces were usually of the refractory tube type, coal or producer gas fired and the patenting effect was obtained by heating to very high temperatures followed by cooling naturally in air. The rate of cooling is the controlling factor and it will be apparent that only one gauge of wire can be cooled at the optimum rate. Thicker than this gauge, cooling is too slow and gives rise to the development of pearlite, which although fine and to some extent, therefore, ductile, is not conductive to the production of the highest physical properties. Another defect of the air cooling process is the separation of ferrite at grain boundaries and the heterogeneous condition has been shown time and time to give rise to rapid failure under fatigue conditions. A more serious factor is the apparent necessity of patenting with very large grain sizes and subsequent research has shown that the large grain size developed as a virtue in the old air patenting process was, in fact, only necessary in consequence of grain boundary separation.

* * *

THE patent steel wire industry was probably the first to introduce what is now known as

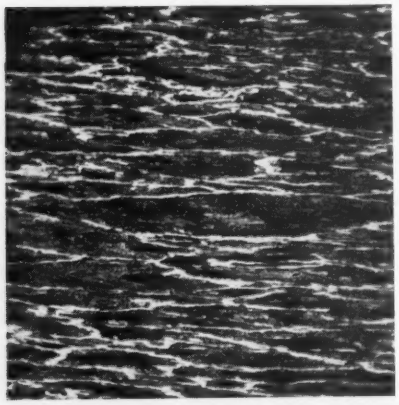

Fig. 2 — Ferrite Envelopes in Air Patented and Drawn Wire. x100. * * * * *

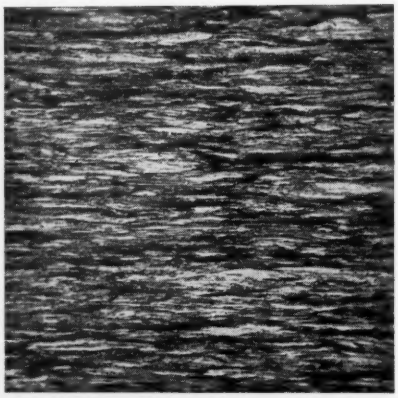

Fig. 13 — Microstructure of Modern Isothermally Patented Drawn Wire. x100. * *

Fig. 14 — Old Patent Steel Mill. * * * * * *

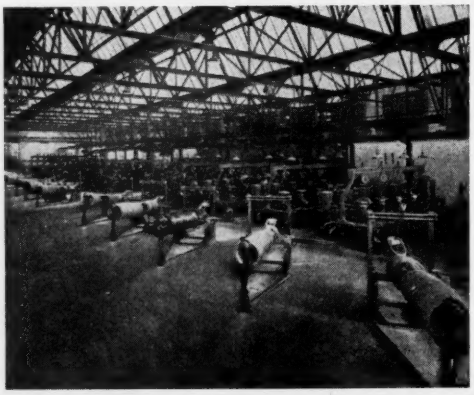

Fig. 15 — Patent Steel Wire Mill, 1936. * * *

isothermal methods of heat-treatment; quenching and holding in lead, rendered the heat treatment reaction independent or nearly independent of mass and made possible development of standardized production methods in the patent steel mill. Fig. 12 shows the air patented condition in its worst form in a drawn wire and the equivalent present day microstructure is shown in the succeeding photomicrograph, Fig. 13. The patent steel wiredrawing mill of 30 years ago is shown contrasted with the present day mill in Figs. 14 and 15, and the differences in control of production can be imagined. The absence of operatives in the last picture must not be taken as evidence that a modern wire mill runs entirely without labour, but it is a fact that this mill employs but six wiredrawers and in practice when the mill is operating, it bears almost the appearance shown in the photograph. Additional labour for welding and transport is available.

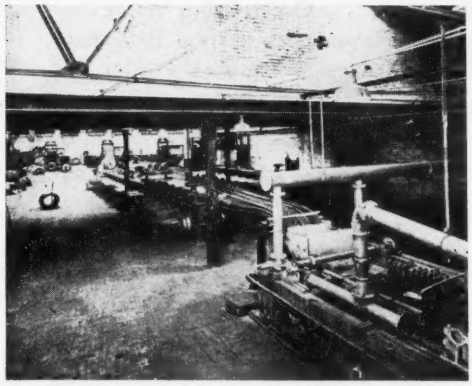

Fig. 16 — Lead Bath For Isothermal Cooling. * *

* * *

THE development of the continuous process for the production of patent steel wire presented some difficulty. Many attempts to draw wire in this manner failed owing to the very poor physical properties obtained and this type of product was probably the last to be taken out of the hands of the single block wiredrawer.

* * *

PATENT investigation showed that rise in temperature during drawing was the controlling factor and that this was the reason for the time-honoured method of resting coils of wire between drafts. That resting was not entirely satisfactory could be proved by opening up coils of wire and feeling inside, when more often than not the hand had to be withdrawn very sharply owing to the high temperature within the body of the piece. Fortunately for the wire mills of that time, the outside of the coil cooled satisfactorily and it was the outer ends that were subjected to test.

* * *

THE temperature rise was ultimately brought under control by the introduction of water cooled blocks and dies, and thought is still being directed to more effective methods of cooling, with a view to facilitating the production of very high tensile strength wires possessing high endurance properties, with greater economy.

* * *

THE isothermal lead bath, Fig. 16, installed on a modern gas fired patenting furnace, is worthy of illustration. It is completely automatically controlled and the control is capable of turning on gas for heating or applying air for cooling through submerged tubes, the

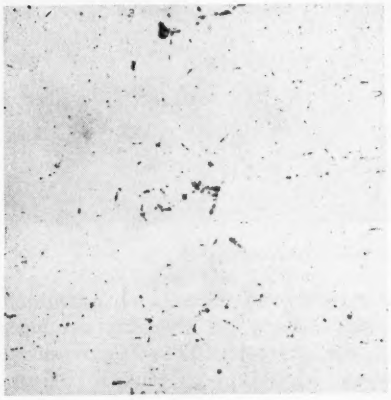

Fig. 17 — 0.65% Carbon, 5 SWG. Rod Lead Cooled to 490°C and Held for 2 Seconds. x100. * * * * * *

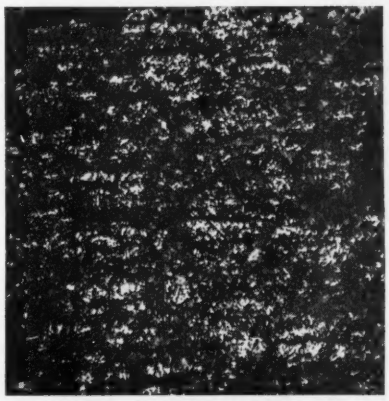

Fig. 20 — 0.65% Carbon, 5 SWG Rod Lead Cooled to 490°C and held for 12 Seconds. x100. * * * * * *

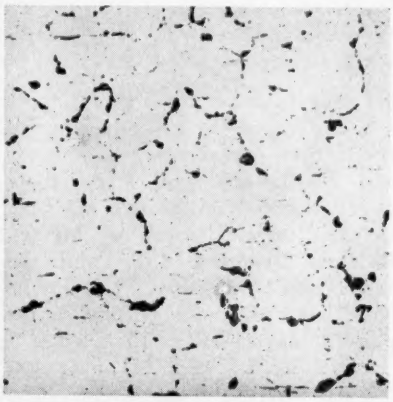

Fig. 18 — 0.65% Carbon, 5 SWG. Rod Lead Cooled to 490°C and Held for 4 Seconds. x100. * * * * * *

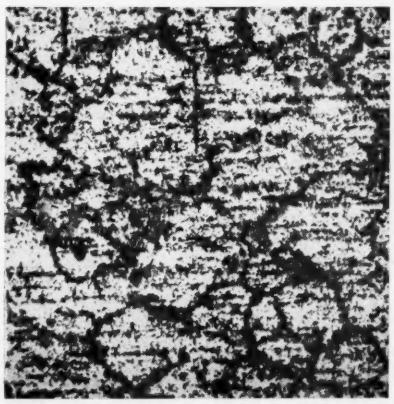

Fig. 19 — 0.65% Carbon, 5 SWG Rod Lead Cooled to 490°C and Held for 8 Seconds. x100. * * * * * *

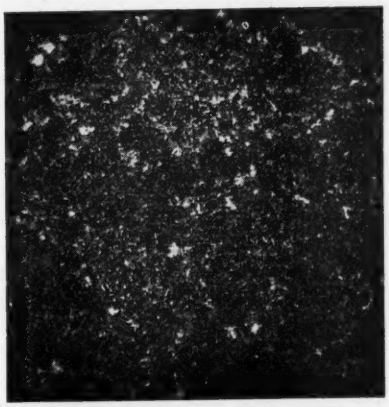

Fig. 21 — 0.65% Carbon, 5 SWG Row Lead Cooled to 490°C and Held for 20 Seconds. x100. * * * * * *

precise condition depending upon the gauge being heat treated. The length of the lead pan is adequate to cover the time of the isothermal transformation; this is determined by the speed of the smallest size of wire heat-treated and the reaction has been evaluated experimentally at 10 seconds for normal manganese contents and 20 seconds for manganese contents in the region of 1%.

* * *

PHOTOMICROGRAPHS showing the changes taking place during the transformation of a .65% carbon 5 gauge rod, when passing through the lead pan, are shown in Figs. 17, 18, 19, 20 and 21. Studies of this nature are necessary in designing and controlling the modern patenting process and as the transformation times and the precise method of transformation breakdown of the austenite depends largely on the size of wire and the chemical composition of the steel, the amount of scientific work involved in the control of this plant is considerable.

* * *

THE resultant fine grain microstructure possible from this process produces wires having exceptionally high bend values, together with good torsion tests. In addition, endurance tests carried out both in the Laboratory and in the field are proving the unsoundness of the old ideas regarding grain size and fibre length for a long time so popularly held in this country.

Galvanizing

Developments in this field have also been of a striking character. The plant in Warrington is capable of handling some 900-tons of wire weekly, covering the full range of wire sizes both in mild and patented steels and it can be well imagined that operations of this magnitude require very careful control if the plant is to pay its way. Hot galvanizing, which has been practiced almost as long as wire has been produced by power, underwent a revolutionary change some 20 years ago with the introduction of the **Crapo** process.

* * *

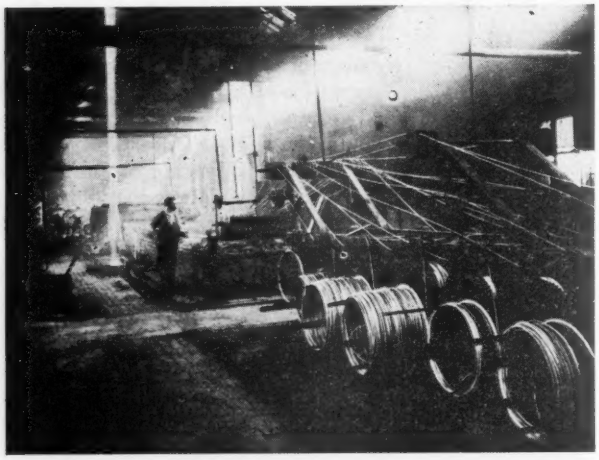

Fig. 22 — Old Hot Galvanizing Unit. * * * * * *

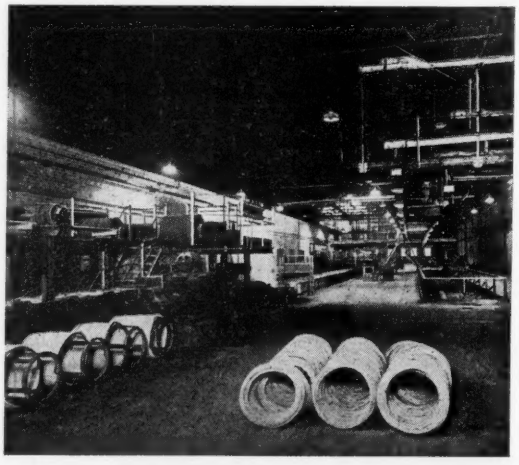

Fig. 23 — New Electro Galvanizing Unit. * * * *

PRIOR to this time, the somewhat crude units in use involved withdrawing the wire from the galvanizing bath at an angle through deep beds of sand, as shown in Fig. 22. This encouraged the production of a pronounced eccentricity of the coat, which usually comprised a coarse dendritic growth of the iron/zinc compound, with a superficial layer of fairly pure spelter. These coatings were, of course, decidedly brittle and fully galvanized wires were incapable of being formed without the coating cracking and peeling off.

* * *

THE **Crapo** process modified the condition of the iron/zinc alloy and by withdrawing the wires vertically, ensured a concentric zinc film. Just prior to the war, however, the **Crapo** process was displaced by favour of the highly developed **Tainton** Electro-deposition process, which has been very fully described elsewhere.* This process, is characterized by the necessity for the removal of most of the common impurities of commercial zinc and the almost total elimination of some of the rarer metals such as Germanium, which when present in quantities greater than 10 parts per million, seriously affected the efficiency of the operation. Much active electro-metallurgical research is being directed to the surface condition of various types of wire in relation to the quality and finish of the resultant product and the flexibility which this process affords for producing composit coatings is being examined with a view to the improvement of the corrosion life of galvanized wire.

* * *

A view of one unit of this plant is given in Fig. 23 which is in marked contrast to that of the earlier process shown in Fig. 22.

* * *

IN conclusion, I must pay tribute to the happy band of adventurers, production management, engineers and electricians who made these developments possible and not least to the Technical Staff of **Messrs. Rylands Brothers, Ltd.**, and the **Whitecross Company, Ltd.**, who have laboured painstakingly in the pursuit of scientific knowledge.

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* **The "Tainton" Electro-Galvanizing process for BRYLANised wire by H. Roebuck and A. Brierley, J. Electrodepositors' Tech. Soc., 1946, 21, 91-101.**

The Aetna Wire Drawing Unit

by E. J. P. Fisher and A. L. Thurman
Wire Mill Consultant Asst. to the Vice President
The Aetna-Standard Engineering Company
Youngstown, Ohio

Part II

Part I was published in the August Issue of WIRE AND WIRE PRODUCTS

Aetna Unit Sizes and Capacity Ratings

THE first Aetna wire drawing Unit was designed and built to accommodate a 22-inch block and has since been designated as the 22" Aetna Unit Wire Drawing Machine.

* * *

HOWEVER, it was anticipated that several Unit sizes should be developed to meet the requirements of the Wire Industry for production of heavy, medium and light gauges of wire, exclusive of the fine wire range. Hence, Aetna engineers have developed four (4) different Unit sizes, which are now designated and classified as shown in Table A.

* * *

WITH these four Unit sizes and capacities and with six standard block sizes it is possible to select the most effective combination of Aetna Units to perform any practicable multidraft wire drawing schedule with any ferrous or nonferrous material that can be continuously cold drawn without process annealing between drafts.

* * *

FOR example, it is practicable to draw #22 ga. (.0286") low carbon steel wire directly from the #5 ga. rod without intermediate process annealing. Under proper conditions of analysis, rod surface, die shape and drawing lubrication this extreme reduction could be done continuously in ten (10) drafts within a finishing speed range of 1500 to 2000 feet per minute. The basic machine requirement would be — One (1) — Aetna 10-Unit Continuous Wire Drawing Machine.

* * *

ASSUMING that, in order to utilize the full productivity of this machine for a schedule of eighteen turns (144 hours) per week, the mill must finish other sizes and grades of steel wire; this Aetna 10-Unit machine could be arranged for alternate operation as —

one (1) — 10-Unit tandem and as two (2) separate 5-Unit tandems.

* * *

THIS 10-Unit machine would be equipped with auto-rheostatic control mechanisms as indicated in the following Unit specifications:

Unit #1 would be equipped with a 16"/22" double-deck block and a 22" auto-rheostatic speed control mechanism above the upper deck.

Units #2, #3 and #4 would each be supplied with a 16" intermediate block with auto-rheostatic speed control.

Unit #5 would be equipped with—

1—Combination 16" intermediate/finishing block and stripper, with a combination manual and automatic rheostatic speed control mechanism.
and 1 — Interchangeable 22" finishing block and stripper.

Units #6, #7, #8, and #9 would each be supplied with a 12" intermediate block with auto-rheostatic speed control.

Unit #10 would be equipped with—

1—12" finishing block and stripper and manual rheostatic control
and
1—16" interchangeable finishing block and stripper.

TABLE A

UNIT SIZE & DESIGNATION	NOMINAL MAX. DIE PULL CAP.	NOMINAL MAX. MOTOR RATING	BLOCK DIAMETERS
30" Aetna Unit	16000 lbs.	75/100 H.P.	22"-30"-26"
22" " "	8000 lbs.	50/60 H.P.	16"-22"-26"
16" " "	4000 lbs.	25/30 H.P.	12"-16"-22"
12" " "	2000 lbs.	10/15 H.P.	12"-16"

Note: Height of draft line — 36" — same for all Units.

TABLE I

UNIT POWER AND SPEED DATA : 10-UNIT MACHINE

Unit No.	Unit Size	Motor H.P.	Motor R.P.M. @ 230 V.-D.C.	Block Diam.	F. P. M. Available
1	22" 2-deck	30/40	300-1500	16"	L.D. 276 — 138
				22"	U.D. 38 — 190
2	16"	20/30	400-2000	16"	55 — 275
3	"	"	"	"	78 — 390
4	"	"	"	"	112 — 560
5	"	"	"	16"	160 — 800
				or (22")*	or (220 — 1100)
6	12"	7.5/10	400-2000	12"	164 — 820
7	"	"	"	"	205 — 1025
8	"	"	"	"	256 — 1280
9	"	"	"	"	320 — 1600
10	"	"	"	12"	400 — 2000
				or (16")*	or (533 — 2665)

* Interchangeable finishing block.

TABLE II
L. C. & H. C. STEEL WIRE DRAWING CAPACITY : 10-UNIT MACHINE

Finish Wire Diam.	Low Carbon Steel Wires: No. Drafts	Start Size	% Reduction: Draft	% Reduction: Total	Max. FPM	Finish on Unit No.	High Carbon Steel Wires: No. Drafts	Pat'd Size	% Reduction: Draft	% Reduction: Total	Max. FPM
.128"	3	#5 Rod	28.6	63.5	740	# 5-22"	3	#5 Rod	28.6	63.5	500
.116"	3	"	33.0	70.0	830	"	4	"	26.0	70.0	600
.104"	4	"	30.0	76.0	800	"	4	"	30.0	76.0	750
.092"	4	"	34.0	81.2	840	"	5	"	28.3	81.2	715
.080"	5	"	32.3	85.8	820	"	6	"	27.8	85.8	700
.072"	5	"	35.2	88.5	800	# 5-16"	6	"	30.2	88.5	800
.064"	6	"	32.9	90.9	800	"	6	"	32.9	90.9	800
.056"	7	#5 Rod	31.6	93.0	1340	#10-16"	9	.177"	22.6	90.0	700
.048"	8	"	31.0	94.9	1790	"	9	.162"	23.6	91.2	900
.040"	9	"	30.8	96.4	2000	"	9	.128"	23.0	90.5	1500
.036"	10	"	29.8	97.1	"	#10-12"	9	.116"	22.8	90.4	1900
.032"	10	"	31.5	97.7	"	"	9	.104"	23.0	90.5	2000
.028"	10	"	33.3	98.2	"	"	9	.092"	23.2	90.7	"
			ANN'L'D								
.048"	5	.128"	32.4	85.9	1950	#10-16"	5	.116"	29.7	82.8	1000
.040"	5	.104"	31.6	85.2	2000	"	5	.092"	28.3	81.1	1600
.036"	5	.092"	31.3	84.7	"	#10-12"	5	.080"	27.4	79.7	2000
.032"	5	.080"	30.7	84.0	"	"	5	.072"	27.7	80.2	"
.028"	5	.072"	31.5	84.9	"	"	7	.064"	21.0	80.8	"
.024"	5	.060"	30.6	84.0	"	"	7	.056"	21.5	81.6	"
.022"	5	.056"	31.1	84.5	"	"	7	.048"	20.0	79.0	"
.020"	5	.048"	29.5	82.6	"	"	8	.048"	19.7	82.6	1800

Units #1 to #5, incl., would be electrically controlled for separate 5-Unit tandem operation.

Units #6 to #10, incl., would also be electrically controlled for separate 5-Unit tandem operation.

Both 5-Unit groups could be linked electrically through an intergroup switch for 10-Unit tandem operation. Table I shows the Unit motor, power and speed ratings.

* * *

NOTE: The double-deck (16"/22") block on Unit #1 would afford facilities for finishing—

6-draft wire on Unit #5
and 11-draft wire on Unit #10
as further indicated in Table II above.

* * *

With this selection and arrangement of 22", 16", and 12" Aetna Units, the mill could draw all of the various finished sizes of both low carbon steel and high carbon steel wires shown in the following Table II. (Above).

* * *

AS the data in Table II indicates, one of several sizes of wire may be drawn on the first five Units while simultaneously finishing one of the several 5-draft finer sizes on the last five Units. For example, 5-draft .092" H.C. wire may be drawn simultaneously with 5-draft .032" H.C. (or L.C.) wire. Any wires within the finishing size range of .128" — .020" and within the grade range of standard carbon steel wire analyses, namely .05% to .80% carbon, may be drawn on the 10-Unit machine described above.

FURTHERMORE, the operator would not be limited to use of the average draft reductions shown in the table; but could use heavier reductions on the first five Units and lighter reductions on the last five Units (if desired) to give the same total reduction from starting size to finish. For example, .028" low carbon wire could be drawn in ten drafts from #5 rod according to any one of the draft schedules shown in Table III. (Below).

* * *

BY comparing the wire draft speeds shown in Table III with the corresponding Unit speed ranges shown in Table I (both in F.P.M.)

TABLE III
OPTIONAL DRAFT SCHEDULES FOR .028", L.C. WIRE

Draft No.	SCHEDULE "A": % Red per Draft	Wire Diam.	Wire F.P.M.	SCHEDULE "B": % Red. per Draft	Wire Diam.	Wire F. P.M.	SCHEDULE "C": % Red. per Draft	Wire Diam.	Wire F. P.M.	SCHEDULE "D": % Red. per Draft	Wire Diam.	Wire F. P.M.
Start		.212"	(34.8)		.212"	(34.8)		.212"	(34.8)		.212"	(22.0)
1	33.3	.173	52.3	42.0	.1615	60	38.0	.167	56.2	42.0	.1615	38
2	"	.1415	78.4	39.0	.126	99	38.0	.1315	91	32.2	.133	56
3	"	.1155	117.5	38.0	.099	160	38.0	.1035	146.5	"	.1095	83
4	"	.0945	176	36.0	.079	251	38.0	.0815	236	"	.090	123
5	"	.077	265	34.0	.064	383	38.0	.064	383	"	.074	181
6	"	.063	395	32.0	.0525	570	28.0	.054	539	"	.061	267
7	"	.0515	590	30.0	.044	810	28.0	.046	741	"	.050	394
8	"	.042	890	28.0	.037	1150	28.0	.039	1030	"	.0413	582
9	"	.0343	1330	26.0	.032	1530	28.0	.033	1440	"	.034	858
10	"	.028	2000	24.0	.028	2000	28.0	.028	2000	"	.028	1267
Tot. — 98.25%				Tot. — 98.25%			Tot. — 98.25%			Tot. — 98.25%		

UNIT AND WIRE DRAFT SPEEDS IN F.P.M.

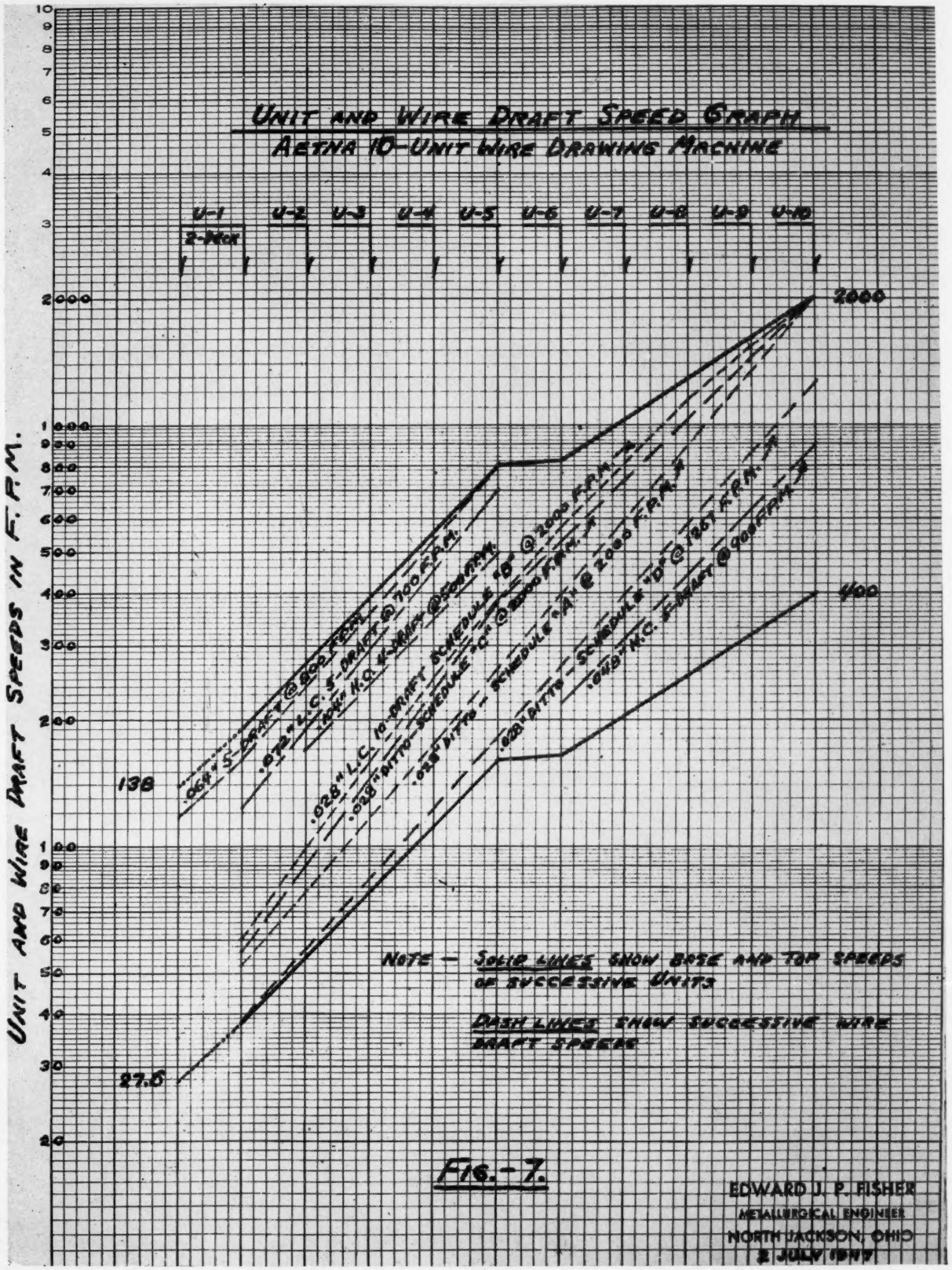

FIG. - 7.

EDWARD J. P. FISHER
METALLURGICAL ENGINEER
NORTH JACKSON, OHIO
2 JULY 1947

it will be noted that the successive draft speeds required by any or all of the several draft schedules do come within the adjustable speed ranges of the respective Units. Therefore, any one of the draft schedules for 10-draft .028″ L.C. wire may be used with full assurance of complete auto-rheostatic synchronization of the speeds of the first nine (9) Units with respect to any finishing speed of Unit #10 within the range of 1267 to 2000 F.P.M.

* * *

THIS is shown graphically in Fig. 7. Likewise, the draft speed curves for all of the finished wire sizes listed in Table II could be plotted within the confines of the same Unit Speed graph. However, in addition to the four (4) curves for 10-draft .028″ L.C. wire, only four (4) other draft speed curves could be clearly shown in Fig. 7, namely those for —

6-Draft .064″ L.C. wire @ 800 F.P.M. finishing on Unit #5
5-Draft .072″ L.C. wire @ 700 F.P.M. finishing on Unit #5
4-Draft .104″ H.C. wire @ 500 F.P.M. finishing on Unit #5
and 5-Draft .048″ H.C. wire @ 909 F.P.M. finishing on Unit #10

* * *

THESE four additional curves are also presented as graphic evidence of the exceptional versatility of the Aetna Multi-Unit Wire Drawing Machine.

* * *

THUS, when two or more Aetna Units are grouped for tandem operation and equipped with the Aetna-Fisher auto-rheostatic synchronizing control, the combination becomes at once a most modern, versatile and automatic continuous wire drawing machine, useful for high speed production of high quality wires.

* * *

Electric Equipment

SEVERAL interesting problems are involved in the application of electric equipment to the versatile Aetna Wire Drawing Unit. As indicated previously the Unit can be used in numerous combinations, either as a single draft machine, or in any of various tandem arrangements.

Single Unit Machine

THE various types of electric drives which may be used for driving the Aetna Unit for operation as a single or double-deck Unit are:

1. **Single speed A. C.**
2. **Multi-speed A. C.**
3. **A. C. motor with eddy-current clutch.**
4. **Constant potential D. C.**
5. **Variable voltage D. C.**

* * *

THE single speed A.C. drive may be either a squirrel cage or wound rotor induction motor, but the application of a squirrel cage induction motor is generally limited to wire drawing units for operation at low drawing speeds, because with this type of motor it is practically impossible to provide smooth and uniform acceleration.

* * *

WHERE a narrow range of wire sizes is to be drawn and a single drawing speed is sufficient, the wound rotor induction motor is quite adequate for Units geared for high drawing speeds, since slow starting and relatively smooth acceleration can be provided by use of a suitable number of controlled points of secondary (rotor) resistance.

* * *

THE multispeed A.C. motor offers a considerable advantage over the single speed squirrel cage induction motor, since the low speed can be used for threading and for drawing heavier wire. Even with this type of motor, however, it is difficult to provide smooth starting. A four speed high slip motor is recommended to provide several operating speeds, and higher drawing speeds than are possible with a single speed squirrel cage induction motor.

* * *

WITH any of the other types of drives listed above a suitable starting means can be provided, but the constant potential D.C. motor is the most commonly used. By using shunted armature control for threading and a sufficient number of series armature resistance steps for accelerating, this type of drive can be made suitable for practically all applications.

FOR smaller machines, special applications, or where a wide range of products is to be drawn from one block, or where there is no D.C. power available, variable voltage D.C. is an ideal drive.

* * *

Multi-Unit Machine

TO date the only means for driving the Units of a tandem machine has been field controlled D.C. motors operating as a group either from a constant potential or variable voltage power source.

* * *

IN general, motor speed ranges of 3/1 to 5/1 by field control can be used to advantage, the actual range depending on the required range of wire reductions. Fig. 7 shows an example requiring motors with 5/1 speed range. Obviously, similar operational features can be provided by using a constant field D.C. motor on each block, with an individual power source, either from a separate generator or variable voltage electronic rectifier, for each motor, all speed variation to be obtained by voltage change. This scheme would make possible a much wider speed cone, but would be so expensive that it could only be justified in the most unusual cases. This is particularly true when it is considered that for most applications a constant horsepower characteristic (available through motor field speed range) is required rather than constant torque (available through variable voltage speed range).

* * *

THERE are times, however, when variable voltage can be used to advantage. For instance, consider again a 10-Unit Machine with a speed cone as illustrated by Fig. 7. These 10 motors would have the field ranges shown, but could be powered from two or more generators. With a generator on each of the two groups of five motors, the first half of the speed cone could be shifted with relation to the second half to provide a still greater range of wire draft schedules; or each group of five motors could be operated separately through

(*Please turn to page* 679)

LABOR RELATIONS

by John B. Stone,
Washington, D. C.

The fifth in a series of articles on the subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

AS the pattern of labor union resistance to the Taft-Hartley law becomes more clear, the more conservative elements among wire and wire products manufacturers appear to be inclined to ride out the present period without any extreme action one way or the other.

* * *

FROM the success of John L. Lewis, boss of the United Mine Workers in obtaining a contract without a strike which circumvents some of the provisions of the new labor act most objectionable to labor leaders, the more aggressive and powerful unions have taken their cue. The traditional "no strike" clause in the miners' contract was modified by Lewis to specify that the men would work at all times when they were "willing and able". This was done to circumvent the section of the Taft-Hartley act which allows employers to sue unions for damages caused by unauthorized or "wildcat" strikes.

* * *

MOST powerful unon to follow the Lewis "line" outrightly so far has been the United Automobile Workers. Under the leadership of their Ford divisional vice president, Richard T. Leonard, the UAW have precipitated strike action in order to obtain the same or at least similar "escape" provisions in their contract with Ford. Only two major differences divided management and the union when the strike vote was taken — these escape provisions and details of the pension fund which the company had offered to establish. Spokesmen for both labor and management readily admitted that the pension fund differences could have been worked out easily and that the only real issue was the "escape clause" impasse.

THUS it becomes increasingly clear that workers in the most powerful unions are willing to take real losses through strike action in order to circumvent the penalty clauses in the Taft-Hartley act.

* * *

THE CIO United Electrical, Radio and Machine workers, the CIO Mine Mill and Smelter Workers and even such normally "conservative" unions as the AFL's Brotherhood of Electrical Workers have made it clear that they will leave no stone unturned in fighting the new law. All three of these organizations and others whose jurisdiction crosses wire and wire products lines, have been most emphatic in declaring that they will not abide by terms of the new law which they and their attorneys consider unconstitutional. Most eagerly seized upon feature of the law is that forbidding use of union funds for political activity. Union papers have rushed into print with records of Congressmen on major issues in order to deliberately violate the law and force a test case.

* * *

OF course, this phase of the controversy has little direct application to labor-management relations but men long experienced in labor circles do not hesitate to predict that in most cases the same beligerent attitude will be taken by labor leaders towards other features of the new law.

THEY declare emphatically that in most cases where aggressive unions are involved the same demands for escape clauses made by the United Auto Workers and the United Mine Workers will be put forward whenever new contract negotiations are opened.

* * *

SO it becomes clear that within the next year a definite turning point will have been reached in the labor relations of the Wire and Wire Products industry as well as most other leading industries of the country.

* * *

THE question confronting management then is this;

Is it better at this time to fight it out on the issues raised by the unions and force them within confines set by the Taft-Hartley Act or is it better to make the best deals possible now while the militant spirit is abroad in union ranks and wait for the post war boom to level itself out before making a stand?

* * *

ADMITTEDLY there is a sizable element within the industry which wants to get things settled now and have the pattern of labor relations set by the Taft-Hartley Act really put into force. Any losses through strikes at this time, this group feels, can be more than made up for by smoother and less costly operations in the future.

* * *

BELIEVERS in this theory can point to the conciliatory attitude taken by Philip Murray president of the huge United Steel Workers of America as well as the CIO itself. Although emphatically in opposition to provisions of the Taft-Hartley Act, he has time and

(*Please turn to page* 684)

GOVERNMENT WIRE PRODUCTION INFORMATION

Report on German Practice in Restoring Pickling Liquor

THE original strength of spent pickling liquor can be restored by the addition of ethyl alcohol followed by fractional distillation according to a recent German technical monograph now on sale by the Office of Technical Services, Department of Commerce.

* * *

THE paper (in English) was written for the Field Information Agency, Technical, Office of Military Government, by Edmund R. Thews, a German consulting engineer.

* * *

FOUR methods now being used to evaluate or regenerate old and superconcentrated pickling liquors are discussed: Precipitating the excessive iron and sacrificing the acid solution, electrolytic deposition of iron and regeneration of the acid, freezing out most of the ferrous sulphate and regeneration of the acid, and separation of all the ferrous sulphate by addition of ethyl alcohol and regeneration of the acid.

* * *

THE alcohol method is a very efficient and economical process for removing practically all iron and regaining all the acid solution for further pickling use, the report states.

* * * .

ORDERS for the report (PB-44958; **Contribution to the Regeneration of Pickling Solutions;** photostat, $1; microfilm, $1; 6 pages; dated July 1946) should be addressed to the Office of Technical Services, Departament of Commerce, Washington 25, D. C., and should be accompanied by check or money order, payable to the Treasurer of the United States.

U. S. Department of Commerce Office of Technical Services

SPECIFICATIONS for more than 60 German welding electrodes are included in a report on arc welding now on sale by the Office of Technical Services, Department of Commerce. The report was written by investigators for the British Intelligence Objectives Sub-Committee.

* * *

GERMAN modifications of an American automatic flux welding process are described in another OTS report prepared by the U. S. Naval Technical Mission in Europe.

* * *

GERMAN electrodes were generally inferior to British and American products, according to the British investigators. There was inadequate coordination between de-

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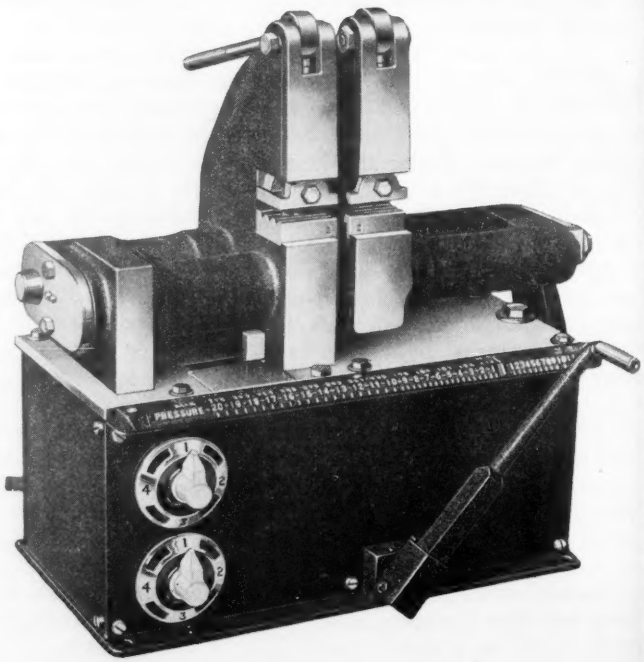

signers of armor welding electrodes and in the field of welding research generally. Furthermore, the manufacturers of welding materials seldom received reports on the performance of tanks, ships and submarines welded with different types of rods.

* * *

GERMAN Army tests were very rough and unstandardized apparently consisting of a few practice trials on tank hulls. Krupp was found to be the only firm which put its welding electrodes through a complete set of standardized tests. Krupp tests were said to be comparable to those used in England. The firm studied spatter, appearance of weld and slag, porosity of weld metal, ease of detaching slag, ease of vertical welding and susceptibility of the joints to cracking.

* * *

MANY German electrodes were modifications of conventional types designed to conserve supplies of critical materials. Specifications are given for austenitic electrodes for armor and alloy steels, special ferritic electrodes for armor, hard surfacing electrodes, mild steel and low alloy high tensile steel electrodes, and special purpose electrodes. The report covers seven major manufacturers: Krupp, Boehler, Deutsche Edelstahlwerke, Griesheimer Autogen Verkaufs, Gutohoffnungshutte, Messer, and Westphalische Union. Plant layouts and diagrams of machinery are included.

* * *

THE Navy technical report describes German modifications of the Unionmelt automatic flux welding process. Machinery and equipment for this technique, known in Germany as the Ellira process, were made by the Lindes Eismaschinen A. G., Muenchen. Notoworthy developments included: The exposed rod feed which makes observation and renewal easier; the plug type melt valve which is leak and wear proof; the free turning rod reel and mounting construction; the method of canting motor and rod reel for fillet weldings while the hopper head was kept vertical; and the compactness and placement of the carriage drive unit.

...keeps his distance

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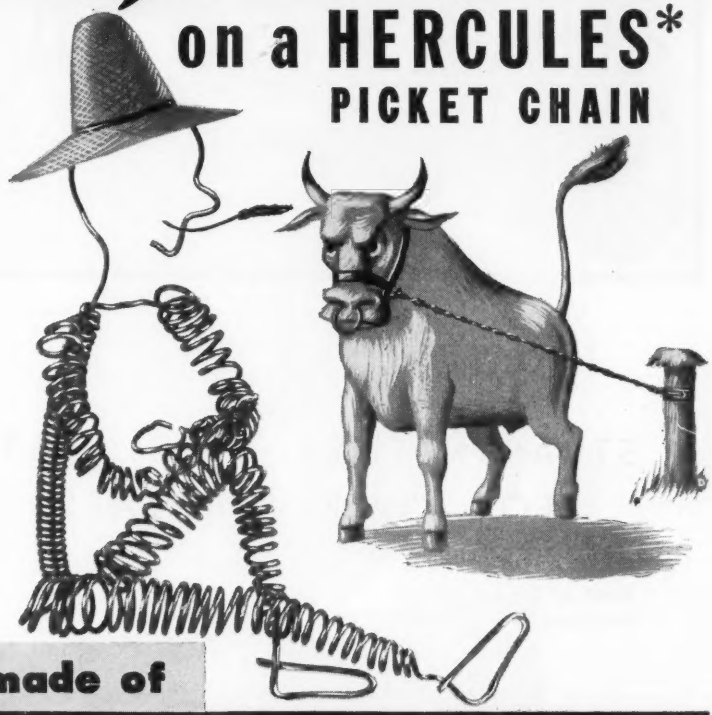
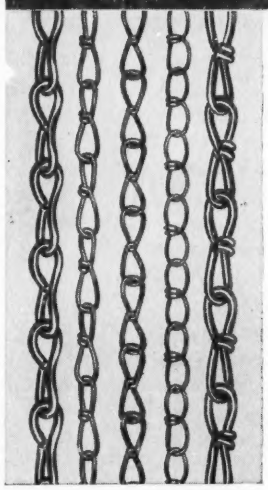


made of

KEYSTONE WIRE



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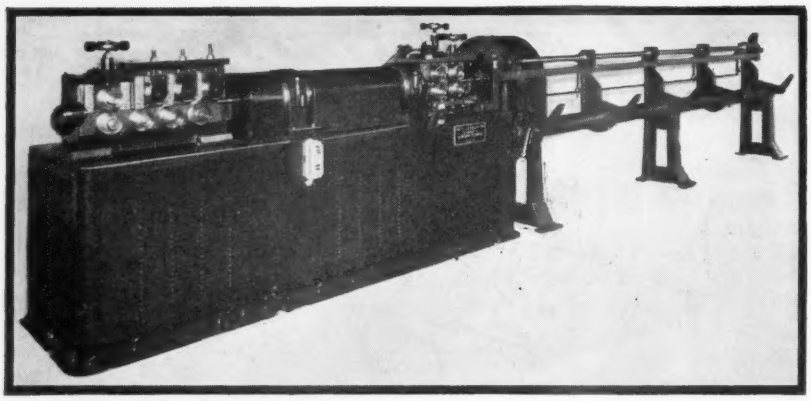

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THE report on welding electrodes is entitled **German arc welding electrodes** (PB-583368, photostat, $7; microfilm, $2; 95 pages), including photos, diagrams, and tables.

* * *

German Wire Rope Industry
PB Report 49200

THIS report by the British Intelligence Objectives Sub-Committee contains over 100 pages of typewritten material, photographs of plants, tables, and a three page table of contents.

* * *

SEVENTY nine firms manufacturing wire rope had a total capacity of approximately 10,000 tons per month. During one year of the war, their average monthly output of ropes was 8500 tons and the output of strands was 6600 tons. The plants were distributed in the various zones as follows: British 37, Russian 24, U.S. 15 and in the French zone 3.

* * *

NEARLY all the wire used was made from basic steel. They did not suffer from any great shortage of zinc and the zinc coat of galvanized wire remained about the same as prewar. A certain amount of electrogalvanized wire was used for high strain wires.

* * *

ALL firms visited agreed that Manila fibre made the best cores, and that Sisal was the next best. Petroleum jelly was considered the best lubricant.

* * *

NO pre-stressing plant was available, because of the opinion that ropes when once pre-stressed must not be recoiled.

* * *

THE lay out of plant was such that there was plenty of room between machines to allow the bobbins to lie without blocking the passages. One man could often work two or more machines. The take off reels were close to the railway so that the finished rope could be rolled into railroad cars.

* * *

THE method of payment used in various plants is illustrated. Several pages are devoted to gen-

eral rope making methods discussing winding. Little welding is done, but in a machine similar to a welder they did some brass brazing. Stranding and closing strands and ropes, closing preformed ropes, post forming stranding and closing flattened strand ropes at various plants visited is described, as well as the type of ropes made.

* * *

FLAT ropes were made in fairly large quantities mostly for balance ropes. Splicing, measuring devices, winders, stranders, closers, locked coil machines, a plaited core machine are described and pictures shown.

* * *

IN a series of Appendices the set up of the Association of German Wire rope works is described; and the technical conditions of sale for usual commercial rope wires (DIN .2078).

* * *

DIN E 1548 of Oct. 1942 is the German standard on Zinc coating on round wire which requires a Preece test reproduced. A copy of a typical test certificate is included. Specifications for wire rope are given and tables of locked construction with dimensions and physical properties.

* * *

TABLES show the export or wire rope by various manufacturers to Holland and Belgium between 1936-1939 and 1940-1942, and world export for 1938.

* * *

THIS report was prepared by A. P. Smith, M.O.S. and G.H.H. Dixon, M.O.S. and the photographs made by E. G. Griffiths, from Material gathered on B.I.O.B. trip No. 1979, March 1946.

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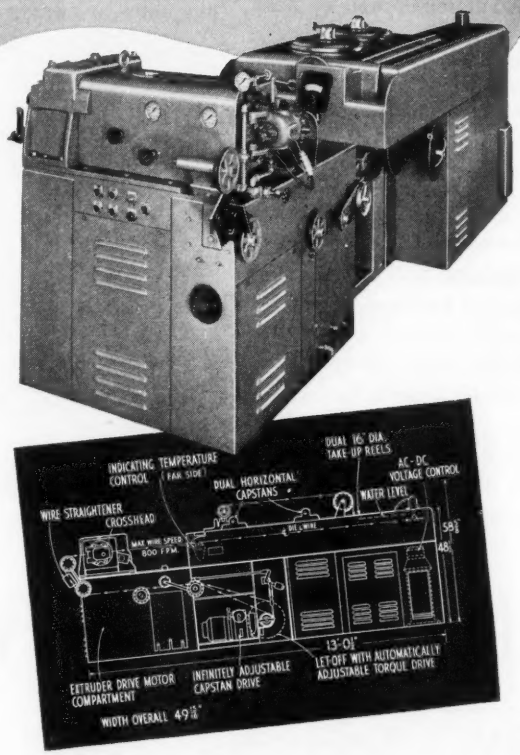

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Joins Loewy Construction Company as Engineer

F. L. Ebersole, formerly Mechanical Engineer, American Rolling Mills, Midletown, Ohio, has joined **Loewy Construction Company, Inc.,** New York, as Assistant Chief Engineer of the Rolling Mill Division. He has spent over 35 years as engineer in various branches of the Steel Industry.

* * *

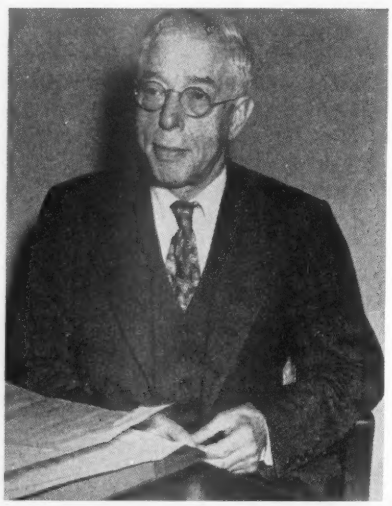
Dobrin Becomes President of Furnace Engineers

HARRY Dobrin has been named president of **Furnace Engineers, Inc.,** Pittsburgh, according to an announcement by the company.

* * *

MR. Dobrin, formerly executive vice-president, is one of the founders of the firm, which specializes in the design, manufacture and installation of furnaces for the metal working industries. The company's main offices are located at 1515 W. Liberty Avenue, Pittsburgh.

* * *



Harry Dobrin, President Furnace Engineers, Pittsburgh, Pa. * * * *

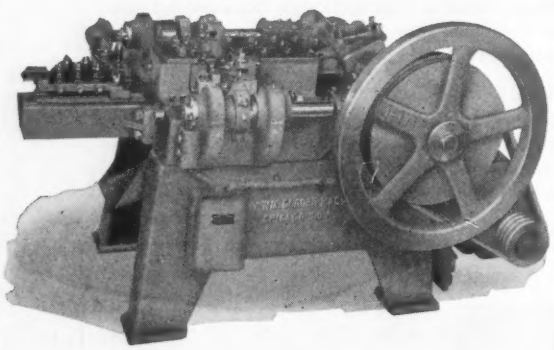
Geary Elected Vice President and General Sales Manager Atlas Steels Ltd.

EDWARD P. Geary of Baltimore, Md. has been elected Vice President and General Sales Manager of **Atlas Steels Limited,** according to an announcement by **Roy H. Davis,** President. He will supervise all commercial activities including both the Domestic and the Export Sales divisions.

* * *

MR. Geary is closing out Geary Stainless Steel Co., Baltimore, Md. He opened the midwestern territory in Chicago for Rustless Iron & Steel Corporation in 1937 and was Asst. Vice President in charge of sales of the company for six years through 1945. In 1939 Mr. Geary was Asst. Managing Director of the newly formed British Stainless Steels Ltd. in Darlington, Eng-

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

land, whose activity was terminated by the war. After attending Carnegie Institute of Technology Mr. Geary had fourteen years of tool steel experience in the production, metallurgical and sales departments of Vanadium Alloys Steel Company and Colonial Steel Company.

* * *

Guillan Joins The Institute of Metals

LIEUT.-COLONEL S. C. Guillan, T.D., has been appointed Secretary of the Institute of Metals, London, England, and Editor of its publications. He assumed his new duties on July 1st, 1947.

* * *

Harry M. Dexter Appointed C-D Sales Manager

CONTINENTAL-Diamond Fibre Company, Newark, Delaware, announced the appointment of **Harry M. Dexter** as Sales Manager effective June 2nd. Mr. Dexter, formerly in charge of the Cleveland Sales Office, transferred his activities to the main office in Newark, Delaware, on August 1st.

* * *

Hackley and Rogerson Advanced by A. S. & W.

LLOYD W. Hackley has been named superintendent of production planning of **American Steel & Wire Co.**, U. S. Steel subsidiary. He succeeds F. J. Boes, retired. At the same time, **James E. Rogerson** has been made assistant superintendent of the production planning department succeeding Mr. Hackley.

* * *

BORN in Chicago, Ill., on April 7, 1908, Mr. Hackley has been associated with American Steel & Wire Co. since October, 1937, when he was engaged as an industrial engineer at Consolidated Works in Cleveland. He later was transferred to the Cuyahoga Works in the planning department where he remained until September, 1942, when he was promoted to the position of assistant general supervisor of production planning at the Company's headquarters in the Rockefeller Building. Since September, 1944, Mr. Hackley has been assistant superintendent of production planning.

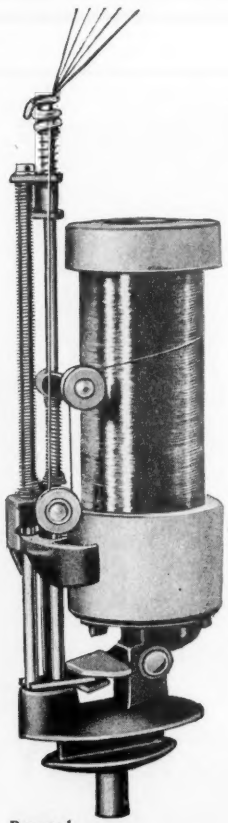
* * *

MR. Rogerson has been associated with the Wire Company since June, 1937, when he started as a junior industrial engineer in the Pittsburgh district office. He has held a number of positions since that time and since September, 1944, he has been general supervisor of procedure and organization in the production planning department.

* * *

U. S. Rubber Appointment

RICHARD B. Carland has been appointed sales promotion manager of the wire and cable department of **United States Rubber Co.**, New York. He will have headquarters in the company's general office in New York.



Patented
2 BX - Special
MOSSPEED Carrier.

MOSSPEED BRAIDER CARRIERS

FOR BRAIDING

MULTIPLE ENDS OF FINE WIRES

A special design MOSSPEED CARRIER and BOBBIN is supplied for braiding "SHIELDED" WIRE, ETC.

Will braid multiple ends of aluminum, brass, bronze or copper wire, etc.

TWO SHEAVE-WHEELS and SPECIAL-TOP-THREADEYE on carrier, together with new type BOBBIN provides an even wire "let-off" resulting in a high quality and uniform braided shield.

Consult our engineers regarding your braiding problems

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Pressed Steel Corp.

18 WEST STREET

ATTLEBORO, MASSACHUSETTS, U. S. A.

European Agent

James Day (Machinery), Ltd., "Ford House," 88 Regent Street, London, W. I., England.

Nelson Retires at Keystone and W. H. Getz Promoted

A. A. Nelson, Retiring Assistant General Sales Manager, Keystone Steel & Wire Co. Peoria, Illinois.

* * * *

REUBEN E. Sommer, President and General Manager of the **Keystone Steel & Wire Company,** today announced the retirement of **A. A. Nelson,** the firm's veteran Assistant General Sales Manager.

* * *

IN making this announcement, Mr. Sommer expressed Keystone's regret in Mr. Nelson's decision: "Art Nelson has made a major contribution to the growth of Keystone sales. When he joined Keystone 41 years ago, annual sales totaled half a million dollars. This year, our sales will exceed 28 million. Keystone customers and associates join me in acknowledging Art Nelson's share in our mutual progress. We'll all miss him."

* * *

SIMULTANEOUSLY, **William H. Getz** was named Manager, Merchant Sales by General Sales Manager, Walter H. Gardner. Mr. Getz, under the reorganization of the sales department following A. A. Nelson's retirement, will supervise the distribution of Keystone agricultural products through jobber and dealer channels.

* * *

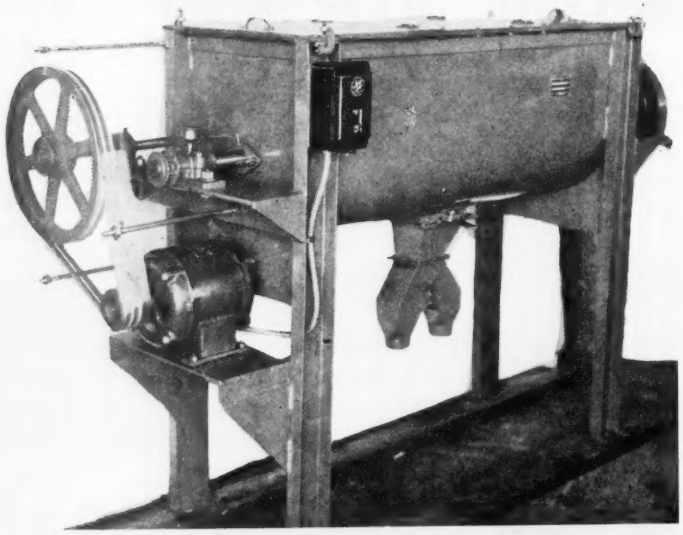
W. H. Getz, Manager Merchant Sales, Keystone Steel & Wire Co., Peoria, Illinois.

CHEMICAL **MIXERS**

Horizontal Batch and Continuous Types made in 1 cu. ft. to 235 cu. ft. capacities, Either Jacketed or Plain.

Custom Mixers Engineered To Suit Requirement of User.

Also make Grinders, Crushers, Elevating and Conveying Equipment, Commercial Type Pressure Cookers, Stranders, Closers, Wire Winders and a General Line of WIRE MACHINERY.



The machine illustrated above is a horizontal mixer.

Put your mill equipment problems up to the

HUGHESVILLE MACHINE and TOOL COMPANY

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Phone: 129-A

WIRE AND PROCESS MACHINERY

THOMAS S. HUGHES
33 Admiral Road
Toronto 5, Ont., Can.

PROMOTION of Mr. Getz to this key position comes after twelve years association with the company. In 1935 he started as mail boy, advanced to clerk in Acounts Payable, then sales. He was promoted to District Director of Industrial Sales in 1936. In this capacity during the ensuing years he has developed new territories and expanded sales of preferred products.

* * *

A. A. Nelson has been continously employed by the Keystone Steel & Wire Company since 1906 when at twenty-one he first joined the organization. During the following four years he was successively and concurrently stockroom clerk, order recorder, traffic router, buyer of office supplies, correspondent. In 1910 he was named salesman — first sales representative for Keystone in the states of Missouri, Kansas, and Oklahoma. In five years he proved himself an exceptional producer, so in 1915 he was recalled to Peoria and named Sales Director. Here for 20 years, he headed divisions of the sales department, until in 1935 A. A. Nelson was promoted to Assistant General Sales Manager. Now, with 41 years of Keystone service behind him, Art Nelson feels like taking it easy. He is a skilled fisherman who loves the tug of a muskie on his line. Mr. Nelson is spending a summer of fishing and relaxation at his Wisconsin cottage on Little St. Germain Lake. He will return to Peoria and his 623 Moss Avenue home in the fall.

* * *

MR. W. H. Getz is a native of Tremont, Illinois. He was graduated from Bradley University in 1935 where he competed in baseball and basketball, as captain of the latter team. With Mrs. Dorothy Getz, his two daughters and young son, Mr. Getz resides at 202 Aiken Avenue.

* * *

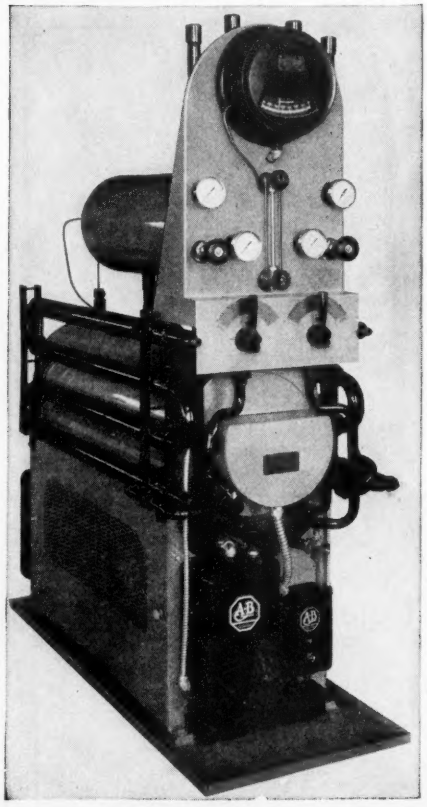
F. G. Lindstrone Appointment

FREDERICK G. Lindstrone, general superintendent, Palmer, Mass. plant, Wickwire Spencer Steel Div. of the **Colorado Fuel & Iron Corp.,** has been made district manager and will supervise subsidiary plants at Palmer, Worcester and Clinton from the Palmer office.

* * *

Reynolds Metals Appointment

C. L. Thompson, Jr. has been appointed sales and technical adviser to David P. Reynolds, vice-president and sales manager, **Reynolds Metals Co.,** Louisville. Mr. Thompson from 1943 to 1946 was assistant to the works manager and superintendent, industrial relations division for the Clinton Engineer Works-Tennessee Eastman Corp., and from 1946 until joining Reynolds, he was director development branch, national housing agency and chief of the marketing section, Office of the Housing Expediter, Washington.



THE ROYLE TEMPERATURE CONTROL UNIT

For Extrusion and Other Industrial Uses

A compact, simply operated unit designed to sustain any pre-determined temperature between 90°F and 475°F. — Hand-lever selection of desired temperature — Heat supplied — or drained — according to operational requirements — Formed piping, elimination of gaskets, and drip pans promote cleanliness — Breakdown of heat transfer oil reduced to a minimum — Three standard sizes 16KW, 32KW, 48KW — Other units with water circulation and refrigeration for operations requiring constantly maintained lower temperatures, 35°F to 200°F.

JOHN ROYLE & SONS ROYLE PATERSON N. J. 1880

PIONEER BUILDERS OF EXTRUSION MACHINES SINCE

London, England — James Day (Machinery) Ltd — REgent 2430
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Los Angeles, Cal. — H. M. Royal, Inc. — LOgan 3261

PATERSON 3, NEW JERSEY

Firth-Sterling Appoints James W. Kinnear, Jr.

FLOYD Rose, chairman of the board of **Firth Sterling Steel and Carbide Corp.**, McKeesport, Pa., has announced the appointment of **James W. Kinnear, Jr.** as Executive Vice President of the Company. Mr. Kinnear has resigned his position of assistant manager of operations of the Pittsburgh District of the Carnegie Illinois Steel Corporation to accept the new position.

* * *

MR. Kinnear is a graduate of Allegheny College and also of Massachusetts Institute of Technology. He started with the Carnegie Steel Company as a laborer in its Open Hearth Department at Homestead Steel Works in 1923, holding various positions in that plant such as chief metallurgist and assistant general superintendent. In 1940 he was promoted to his present position over all the plants in the Pittsburgh District. During the war years he served on various Army and Navy Committees in cosnection with the manufacturing of alloy steels and armour plate. He was also a member of the American British committee for the conservation of alloys.

* * *

MR. Kinnear's father was one of the founders of the Firth Sterling Steel Company in 1896 and was vice president of the company at the time of his death in 1922. Mr. Kinnear has been closely associated with the company for many years and has served as a director since 1932. He assumed his new position August 1, 1947.

* * *

Parker Rust Proof Company Appointments

DR. **R. C. Gibson** has been promoted from the position of director of research to that of technical director of the **Parker Rust Proof Co., Detroit. Dr. Grant C. Bailey**, formerly with the research department of the Phillips Petroleum Co., has been appointed manager of the research department, and **Gaillard W. Dell**, formerly with Bohn Aluminum & Brass Co., has also joined the research staff of the Parker Rust Proof Co.

* * *

General Electric Appointment

ELMER **E. Sheldon** has been named quality control engineer of the **General Electric Co.'s** wire and cable division, Bridgeport, Conn. Mr. Sheldon has been with the company since 1937, when he joined the student test engineers' program at Schenectady, N. Y. One month later he was transferred to Bridgeport in test engineering for the wire and cable division and remained in that capacity until his present appointment.

* * *

J&L Appoints General Superintendent

E **K. Miller** has been appointed general superintendent of the Aliquippa Works, **Jones & Laughlin Steel Corp.**, Pittsburgh. He succeeds Harry Saxer, who has

THE ANNUAL CONVENTION

of the

WIRE ASSOCIATION

will be held at

CHICAGO, ILL. OCTOBER 20-23, 1947 [Inclusive]

Headquarters at the La Salle Hotel

MAKE YOUR HOTEL RESERVATIONS PROMPTLY

The Aetna-Standard Wire Drawing Unit

(*Continued from page* 668)

a much wider speed range. Other combinations could as well be arranged to suit the particular needs of the application. In practically all cases, however, it will be found that the requirements of the application can be met by using a constant potential power supply with the proper motor field speed range on the individual motors. Variable voltage is, of course, the logical selection when no D.C. power is available in the plant.

* * *

FOR the example illustrated by Fig. 7 only two constant potential control panels are required, one for each group of five motors. For other operating requirements, the number of panels required could be as low as one for the group of ten motors, or the number could be as high as ten, one for each motor.

* * *

HER arrangement requir- six starting panels, would by the use of proper accessories on the various Units, provide for the following versatile combinations:

A. Four panels, one each for Unit motors #1, #2, #6, and #7 to provide for operation of each block as an individual unit; Unit #1 for two-draft operation, Units #2, #6 and #7 for single draft operation.

B. Two panels, one for tandem operation of Units #3, #4, and #5, and one for tandem operation of Units #8, #9 and #10.

* * *

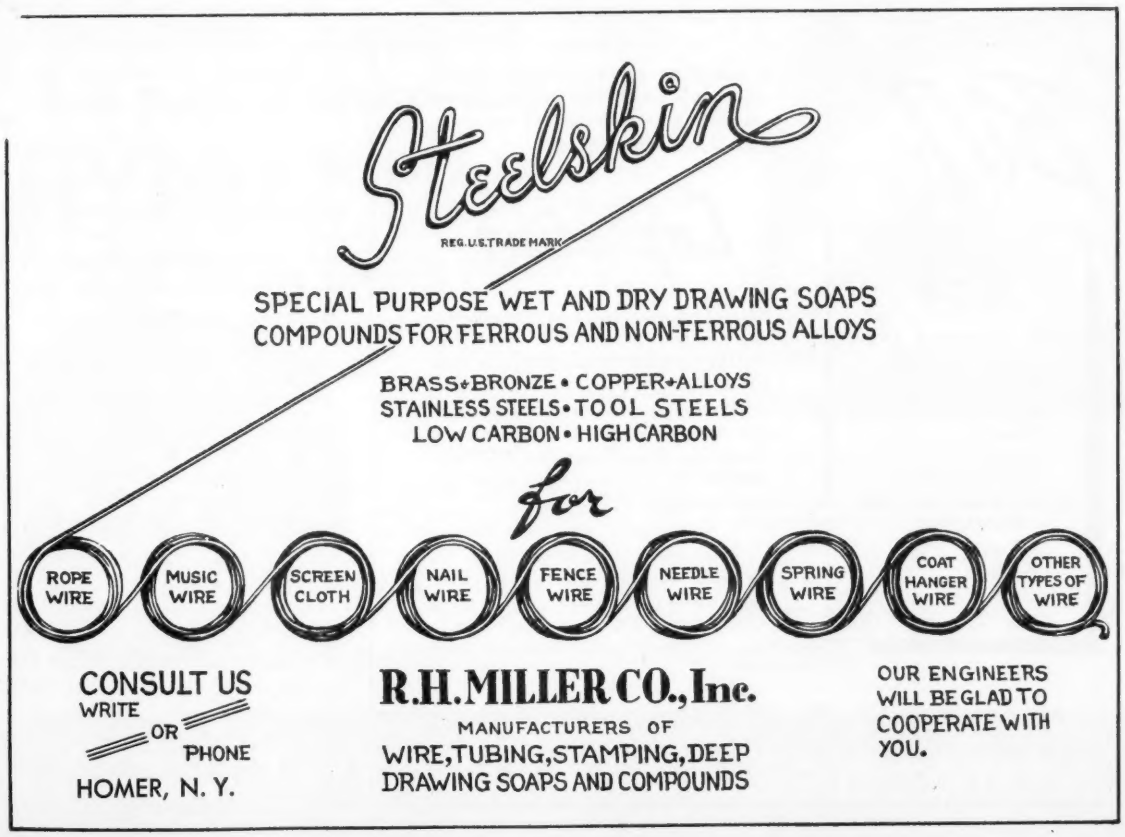
WITH this number of starting control panels, and the proper interconnecting control, the following are **some** of the combinations which are possible:

a. One 10-Unit tandem machine
b. Two 5-Unit tandem machines
c. One 6-Unit and one 4-Unit tandem machine
d. One 7-Unit and one 3-Unit tandem machine
e. One 8-Unit and one 2-Unit tandem machine
f. One 9-Unit tandem machine and one 2-draft single-Unit machine
g. Two 4-Unit tandem machines and two single-Unit machines
h. Two 3-Unit and two 2-Unit tandem machines

FROM the above it is obvious that almost unlimited versatility is possible with constant potential control, even though each motor does not have an individual starting panel.

* * *

ONE particular advantage in using constant potential control is that the auto-rheostatic synchronizing control of the Aetna Multi-Unit Machine provides for the greatest ease of speed adjustment, since only the rheostat on the finishing block of any group operating in tandem need be manually adjusted to change the operating speed of the tandem group. With variable voltage control, voltage change will also change speed, and on the common set-up of this type, it may be necessary to make two adjustments to arrive at the exact desired speed for a given size of wire; namely — adjustment of the generator field rheostat and manual adjustment of the finishing Unit rheostat.



AN arrangement, which would provide for operation similar to that obtained with constant potential control, is to use an A. C. motor with eddy-current clutch on each Unit of a tandem machine. The proper type of control for the eddy current clutch would provide auto-rheostatic synchronization of the tandem Units; but this system would, of course, have the inherent disadvantages of this type of electric drive. A particular drawback is that it has constant torque characteristics and would require high horsepower ratings to meet the power requirements for drawing heavy wire at reduced speeds.

* * *

Aetna Wire Pointer

THIS machine is a sturdy rod and wire pointer, consisting of a pair of grooved gap rolls and a cut-off shear, driven through a combination gear and V-belt drive by a standard constant speed A.C. motor. The complete unit is mounted on an upright pedestal. A foot treadle at the base of the pedestal is arranged to actuate the motor control switch. See Fig. 8.

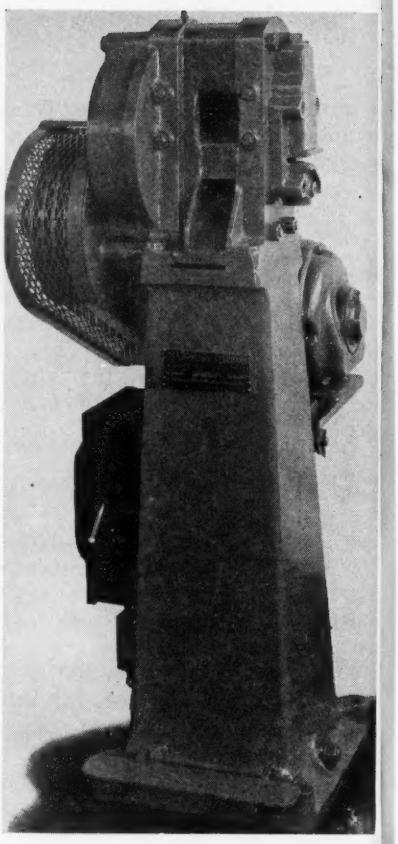


Fig. 8 — Aetna Wire Pointer Machine * *

* * *

THE Aetna Wire Pointer has proven to be a valuable machine tool for rapid production of long tapered points, free from slivers and symmetrically shaped. A series of several roll reduction grooves is available for selection.

* * *

Aetna Unit Performance

RECENTLY, an inspection survey was made to obtain performance data on all Aetna Unit Wire Drawing Machines, which had been in production service during the war years.

* * *

THE number of Aetna Unit Machines and Aetna Wire Pointers so inspected are listed in Table IV: (page 681.)

* * *

ALL of the Aetna Single-Unit and Multi-Unit machines and Aetna Wire Pointers so inspected

BUT...

It would be obsolete now—when industry requires faster, more efficient, more economical methods than those of yesterday.

Cuprodine *

being fast, efficient, and economical, is a "natural" for modern wire mills. "CUPRODINE" lubricates—reduces scratching—prolongs die life—increases linear footage of drawings per die—makes possible uniform drawing. Steel can be CUPRODIZED in a simple immersion process without electricity.

For passivating CUPRODIZED, or solid copper surfaces—and for bonding paint, specify "CUPRO-TEK"*.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine *
Duridine *
Alodine *
Lithoform *
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RUST REMOVING AND PREVENTING
Deoxidine *
Peroline *

PICKLING ACID INHIBITORS
Rodine * *®

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

were found to be in excellent operating condition. All were in constant 24-hour service during the period reported, and they were in regular operation at the time of inspection. Each Unit was running efficiently and smoothly.

Maintenance

ALL users of this equipment reported exceptionally low maintenance cost on these machines. Original gears, bearings, sheaves, blocks, motors and controls were all still in service and in good condition. This performance survey has definitely indicated the sturdy construction and serviceability of the Aetna Wire Drawing Unit and auxiliary equipment.

Closure

BRIEFLY, the salient characteristics of the Aetna Unit Wire Drawing Machine may be summarized as follows:

1. **Sturdy construction and compact arrangement of vertical block and vertical motor in each Unit.**
2. **Interchangeability of Unit components.**
3. **Accessibility and interchangeability of vertical motors.**
4. **Controlled and effective water-cooling of blocks and dies.**
5. **Ultimate versatility through tandem combinations of two or more Units of the same or different sizes.**
6. **Simplicity and ample scope of the Aetna-Fisher auto-rheostatic synchronizing control, which utilizes the FULL speed range of each Unit motor.**
7. **Advantageous utilization of automatically controlled reserves of wire on intermediate Units for —**
   a) **added cooling of wire between drafts;**
   b) **elimination of peripheral slippage of wire on the blocks;**
   c) **facilitation of welding of broken intermediate wires;**
   d) **minimizing of wire breakage during starting or acceleration;**
   e) **avoidance of extreme sensitivity in auto-rheostatic control.**
8. **Insured longevity through practicability of economical regrouping of Aetna Units to surmount future changes in wire production program either by addition to Single Units and Multi-Units or by division of Multi-Units.**

TABLE IV

No. of Machines	Machines Description	No. of Units	Years of Productive Service	Material Drawn
1	22" Aetna Single Unit	1	6.9	High Test Bronze
1	" " " "	1	5.5	" " "
1	" " " "	1	4.9	Stainless Steels
1	" " " "	1	4.9	" "
1	" Aetna 3-Unit	3	7.8	" "
1	" Aetna 4-Unit	4	4.9	" "
10	Aetna Wire Pointers		3.7 — 7.6	" "

IN closing, the authors wish to express their appreciation for this opportunity of describing the many versatile characteristics of the Aetna Unit Wire Drawing Machine.

* * *

WHILE it appears that this Unit has almost unlimited possibilities when applied to any wire drawing requirement; its merits should always be weighed with due consideration for the economics of any given wire mill project.

* * *

IT is the hope of the authors that the Aetna Unit has been disclosed as a significant addition to the roster of modern tools for the Wire Industry.

TUNGSTEN CARBIDE DIES

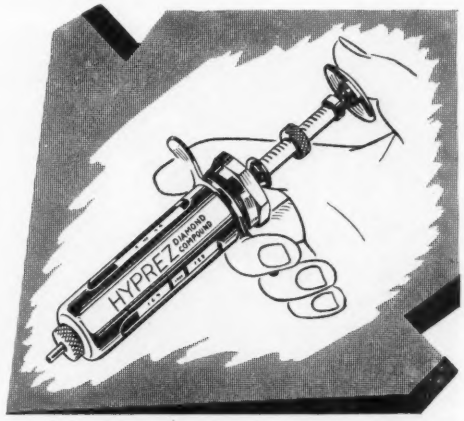
From Rough to Flawless Finish with

HYPREZ DIAMOND COMPOUNDS

Time Saving, Uniform Results

Wire drawing dies of Tungsten-Carbide can be finished complete from rough to lasting mirror polish with Hyprex Diamond Compounds — fast, uniformly, economically.

Accurately graded, fast-cutting diamond particles are permanently and uniformly suspended in the patented compound. All waste is prevented by metered application from the Hyprez gun and by superior adherence of the compound to work and tool. Reliable repeat performance assured — no special equipment or experience required.



Unretouched photo at left shows HYPREZ-FINISHED tungsten carbide die. Customer's name on request.

A complete range of color-identified compounds for all finishing operations available in sealed cartridges for the Hyprez Applicator Gun.

HYPREZ DIVISION

ENGIS EQUIPMENT COMPANY

431 SOUTH DEARBORN STREET • CHICAGO 5, ILLINOIS, U. S. A.

A Review of Recent Wire Patents

No. 2,423,138, WIRE COVERED BELT, patented July 1, 1947 by Melvin A. Crosby, Dayton, Ohio, assigner to The Dayton Rubber Manufacturing Company, Dayton, Ohio, a corporation of Ohio.

The belt has tension, neutral axis and compression sections and is provided with a woven fabric breaker strip surrounding these sections, and strands of wire wrapped thereover.

* * *

No. 2,423,171, COATED NAIL, patented July 1, 1947 by Willis E. Boak, Burton, Ohio, assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

For hammering into wood, this nail has a coating consisting by weight of about 70 parts "fine melt" Congo resin, 30 parts run gilsonite and from 2 to 29 parts plasticizer.

* * *

No. 2,423,289, WIRE WRAPPING MACHINE, patented July 1, 1947 by Charles M. Bellg, Toledo, Ohio.

This wire covering machine includes a rotatable turret comprising a number of concentrically arranged ring-like members adapted for rotation independently of each other, each ring having a hub and supported by the ring next below with a device connecting the rings, and responsive to rotation of the lowermost ring for driving the ring in opposite directions, and a series of wire strand carrying bobbins on each ring member.

* * *

No. 2,423,536, HOOK FOR HOLDING CLOTHESLINES OR THE LIKE, patented July 8, 1947 by Charles C. Wester, Sr., Washington, D. C.

The hook is formed from a single length of wire and includes a pointed end portion, an inverted U-shaped portion, and an arm paralleling the pointed end portion.

* * *

No. 2,423,537, FIRE DETECTING CABLE, patented July 8, 1947 by Dock R. Wheeler, Shreveport, La.

Dual conductors are employed, with the inner of wire and the outer of ribbon-like form and wound spirally around the insulation surrounding the wire conductor. There are interstices in the insulation through which fusion of the conductors will close contact therebetween.

* * *

No. 2,423,923, GUARD FOR ROOFING GUTTERS, patented July 15, 1947 by Hector Andino, Teaneck, N. J.

The guard is constructed mainly of wire cloth.

* * *

No. 2,323,301, ARMATURE AND COIL WINDING MACHINE, patented July 22, 1947 by Hugo B. Boyer, Los Angeles, Calif.

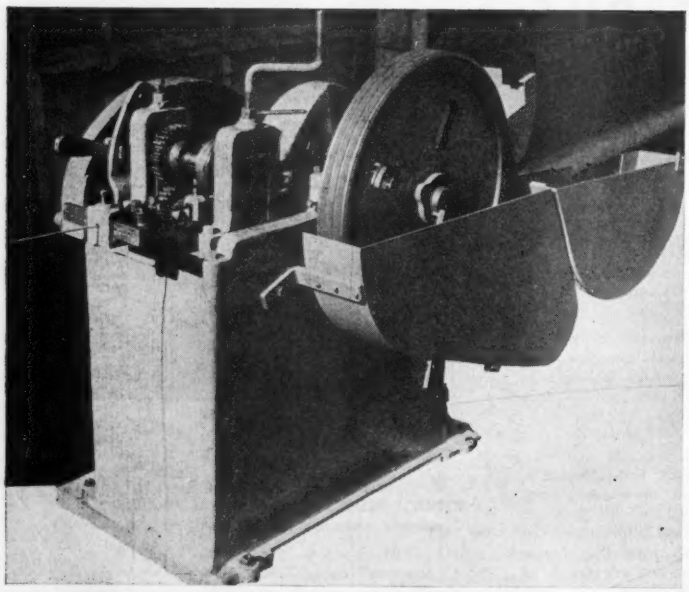
Operating means for winding the armature is controlled by the feet of the operator, seated astride the upper part of the machine, and the arrangement of the wire feed supply is so disposed that the wire being fed is guided by the hands of the operator.

* * *

No. 2,324,382, SPRING FILLING FOR MATTRESSES, SOFAS, SEATS, CUSHIONS, OR THE LIKE, patented July 22, 1947 by Hugo Buttner, Wuppertal-Vohwinkel, Germany: vested in the Attorney General of the United States.

The filling includes cylindrical wire coils functioning independently of each other and wound alternately right and left with the convolutions intermediate the ends of each adjacent oppositely wound spring connected by means of rigid links while the end convolutions of each spring are free from connection with the end convolutions of the adjacent springs.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.



MOST RAPID STAPLE CUTTER EVER MADE

MAKES FENCE STAPLES — POULTRY NETTING STAPLES — DOUBLE POINTED TACKS

Moderately priced — Belt or motor driven.

Write for full details of HUMPHREY RAPID FENCE STAPLE MACHINE.

Prompt deliveries now possible.

Manufactured Exclusively for:

REED and RICHARDS TRANSATLANTIC, Inc.

CHANIN BLDG., 122 EAST 42nd ST., NEW YORK 17, N. Y., U.S.A.

REG. CABLE ADD.: "LOUREED, NEW YORK".

Also Wire Bale Tie Machines, producing single loop, round or oval ties, 2000 per hour; 3 to 16 ft.

No. 2,324,388, BUOYANT CABLE, patented July 22, 1947 by Alfred L. Duna, Worcester, Mass., asignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

About the wire conductor and its dielectric cover are complementary skeleton sections of high thermal conductivity arranged end to end lengthwise of the conductor, each of these sections comprising inner and outer arcuate segments connected by web portions, the inner segments jointly enveloping the dielectric cover with the outer segments being secured together in face-to-face abutment and end-to-end relation. There are buoyant bodies of low thermal conductivity retained between the inner and outer segments, and an outer protective inclosure for the aforesaid components.

* * *

No. 2,424,599, WEEDLESS FISHHOOK GUARD, patented July 29, 1947 by Thomas Steven Burns, Chicago, Ill.

The guard is formed of wire and includes a retraction wire coil spring secured to the end of the fishhook shank and encircling a part of the shank, with a guard extending from the wire spring to the barb of the hook, and covering the barb.

* * *

Philips Expanding X-Ray Production

AS a result of increasing domestic and export demand for its industrial and medical X-ray apparatus, **North American Philips Company, Inc.** has acquired a new 2-1/2 story concrete factory building in Mt. Vernon, N. Y., according to an announcement made by L. J. Chatton, Vice President and General Commercial Manager at the New York offices.

* * *

THE 60,000 sq. feet of space which the new building immediately provides, will enable them to consolidate and expand their engineering, production, testing and warehousing facilities to give better service to industrial and research users of their X-ray apparatus.

* * *

Raw Material Shortage Worrying British Wire Makers

WIRE manufacturers in Britain are passing up very considerable export orders despite the Government plea that export trade be expanded. Crux of the situation is the shortage of raw materials, without which any prospect of satisfactorily completing such orders is futile.

THIS point was stressed at the forty-third anual general meeting of the Darlington Wire Mills Ltd., by Mr. J. E. Hodgkin, M.I.E.E., M.I.M.E., the chairman.

* * *

MR. Hodgkin stated:

"The year under review has not been specially remarkable except from the point of view of the difficulties we have had to face in the matter of the supply or raw materials.

This has been a constant source of anxiety to the management and has resulted in a substantially smaller turnover than we should have been able to show if supplies had been up to our requirements. We have had more than a normal demand for our wire, both for home consumption and from abroad, and there is no doubt that, with the additional facilities in the way of the new patenting furnace and other improvements, we could have shown a record output if supplies had been available. It is a strange and unsatisfactory position that, while we are being urged, in common with all British manufacturers, to increase our foreign sales, we have had to turn down large and profitable orders for the simple reason that we could not secure sufficient rod to meet the home demand."

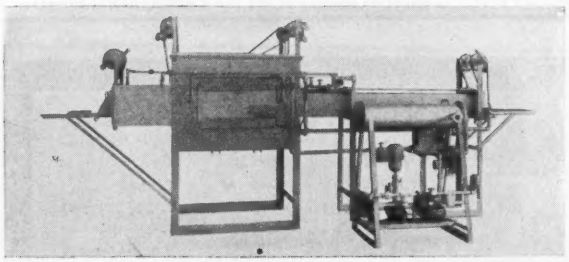
* * *

1926 – pioneered the first practical controlled-atmosphere furnace

"Certain Curtain" ELECTRIC FURNACES

TODAY – providing the most advanced types of controlled-atmosphere furnaces

"CERTAIN CURTAIN" ELECTRIC FURNACES



TYPE LA

For CLEAN annealing, copper brazing, silver soldering in Controlled Atmosphere

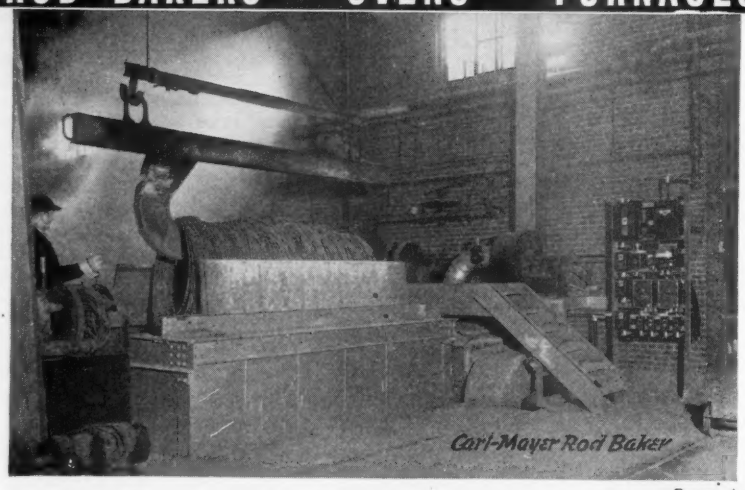
The famed "Certain Curtain" control conquered the most difficult atmospheric problems in high speed steel treating. These same patented methods are available in equipment expressly designed for clean annealing, copper brazing and silver soldering at temperatures up to 2000°F. Conveyor and batch types. Additional external atmosphere generator available. "Certain Curtain" equipment dissociated ammonia or hydrogen assuring the utmost in economical protection for every operation.

AVAILABLE ALSO IN CONVEYOR TYPES AND IN VARIOUS CAPACITIES

Write for "CATALOG 108"

C. I. HAYES, INC. 129 Baker St., Providence, R. I.

MORE PRODUCTION
with CARL-MAYER HI-SPEED
ROD BAKERS - OVENS - FURNACES



Patented
TYPICAL HI-SPEED ROD BAKER — DIRECT OR INDIRECT HEAT — ANY FUEL
WRITE for BULLETIN No. 241

Growing interest in our type of equipment is evidenced by Carl-Mayer installations for such plants as:—

American Steel & Wire Co.
Atlantic Wire Co.
Atlas Steel Co.
Atlas Tack Corp.
California Wire Cloth Corp.
Eaton Mfg. Co.
Frost Steel & Wire Co. Ltd.
Hollup Corp.
Johnson & Nephew Ltd.
Jones & Laughlin Steel Corp.
Pittsburgh Tool Steel Wire Co.
Republic Steel Corp.
Steel Co. of Canada
Wickwire Spencer Steel Div.
Page Steel & Wire Co.

THE CARL-MAYER CORPORATION
3030 EUCLID AVENUE
CLEVELAND, OHIO

JOHNSON XLO MUSIC SPRING WIRE is a leader in the manufacturing field for quality and quantity production of springs. It is available for repair and maintenance . . . in handy packages . . . ¼ lb., ½ lb., and 1 lb. units . . . in full range of sizes from .003" to .200" dia. Every manufacturing plant needs it. Keep on hand a complete line to meet any emergency. Your mill supply house has stock now available.

If your distributor does not have Johnson Wire consult our nearest office.

JOHNSON
STEEL AND WIRE COMPANY, INC.
WORCESTER 1, MASS.
NEW YORK DETROIT AKRON CHICAGO LOS ANGELES TORONTO

Labor Relations

(*Continued from page 669*)

again called for adherence to terms of the two year contract negotiated with "big steel" last winter and he has cautioned his members not to strike in violation of that contract for any cause.

* * *

MANAGEMENT leaders who believe the time for the show down it at hand point to this attitute as an indication that Murray can be forced to go along with terms of the Taft-Hartley Act if management stays "tough". They also believe that now is the time to force the United Steel Workers to make less drastic contracts with processors than are made with basic steel producers.

* * *

ON the other hand those leaders in management who believe that labor-management relations can best be worked out by the workers and their employers without reference to labor laws are inclined to ride along during the current economic period.

* * *

THEY feel that labor legislation is essentially a political rather than a business activity and hence subject to political changes. They prefer to make their own deals with labor now and allow economic laws to take care of the future. The time for a showdown favorable to management, they argue, is not now when demand in most fields is outrunning supplies, but rather at a leveling off period when demand has dropped and inventories are piling up.

* * *

A point in case on this theory is the contract recently signed by Herman W. Steinkraus for Bridgeport Brass with the Mine, Mill and Smelter Workers. Steinkraus has been held up by the National Association of Manufacturers as a model in labor relations. His new contract calls for an 11-1/2 cents an hour wage increase and six paid holidays. This is the general pattern set earlier in the UAW negotiations with General Motors and the steel workers contracts.

German Production of Galvanized Hot Tinned and Enameled Hollow-ware

THE reports by Dr. Ing. F. Adler and D. Baldwin is BIOS final report 793, which has been given the number PB 52871. This is one of a series of special technical reports published in Cooperation with OTS by Hobart Publishing Co., Box 4127 Chevy Chace Br., Washington, 15 D. C., and retails at $4.

* * *

A team of 4 men visited some 15 large and smaller concerns in the British industry which had to do with the Hollow-ware Industry. Summary reports are given on ten plants and one enamelling frit manufacturer. The ten plants which before the war employed some 4500 employees were using in June 1946 only 2150. Six of the plants visited had galvanizing pans, 4 tinning operations and 2 enameled ware.

* * *

SEVERAL plants had repaired any war damage, some were highly mechanized and others had only equipment which required considerable manual handling. One concern used ingenious machines to make seams and diagrams that are included in the report. Most of the pickling is done in muratic acid, apparently no inhibitors were used, and the fluxes were essentially sal amoniac, but some more complete mixtures are listed. The galvanizing was done mostly in kettles whose tops were level with the floor, they are coal fired from below. The temperatures used were between 450 and 470 C.

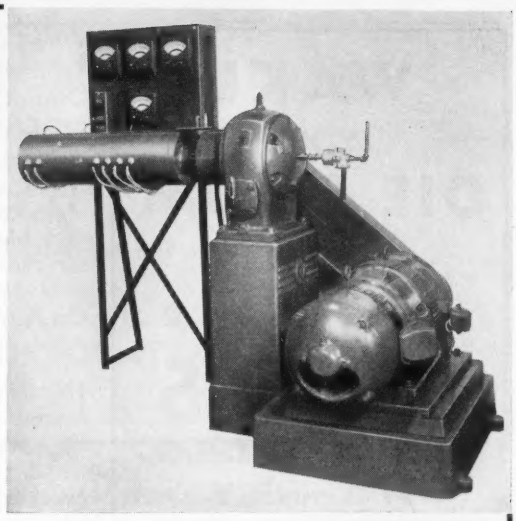
* * *

BLANKS subjected to deep drawing were bonderized to reduce the number of necessary anneals. In view of the shortage of tin milk cans were sprayed with a special lacquer after bonderizing.

* * *

SEVERAL tables give analyses of frits used or made by a couple of concerns. The team concluded that the German Hollow-ware industry was in no way superior to its counterpart in the United Kingdom.

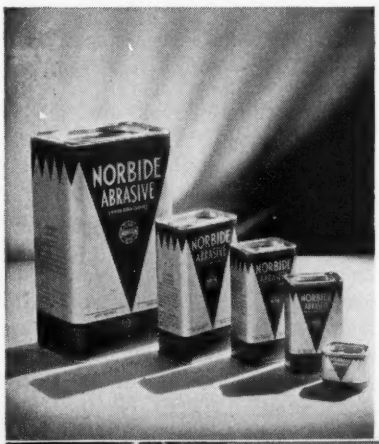
THE COMPLETE *ENGINEERED* EXTRUDING MACHINE!



Tested and approved for years by only a chosen few, as a custom-built machine, the G & V Extruding Machine is now available to all. No. 1 (2-1/4" bore) Extruder for immediate delivery.
Write for further information on the extruding machine for rubber, plastics and wire coating that is not at "adaptation out of desperation", but an entire equipment designed "from stem-to-stern" for your specific production requirements.
Completely packaged units or bare machine offered for your requirements.

G. & V. MACHINE CO. INC.
30 - 32 Dale Avenue **Paterson, N. J.**

Licensed by Western Electric Co. as a manufacturer of continuous-cure wire insulating extruders. Manufacturer of special head fixtured and stock screws. Extruders with oil, electric or steam heat. Accessories for all types of extruding. A complete service.



NORBIDE ABRASIVE
For Cemented Carbide Dies

NORBIDE Abrasive is successfully used for cutting and semi-finishing cemented carbide wire drawing dies. This abrasive is second only to diamond powder in hardness and is 150 times less expensive. Sizes 220 and 240 for ripping; 320F for semi-polishing; 500 to 800 for final finishing.

NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

WAKE YOUR DIE ROOM UP WITH ROOS

WIRE DIE FINISHING MACHINERY

WE MAKE MODERN

AUTOMATIC MACHINERY TO INCREASE THE *EFFICIENCY* AND *PRODUCTION OF* TUNGSTEN CARBIDE DIAMOND and PLASTIC

DIES

● ***NEW*** **ROOS**

AUTOMATIC POLISHERS

● ***NEW*** **ROOS**

PIN MAKER

● ***NEW*** **ROOS**

PREMIUM PIN GRINDER

and

ALL TYPES OF LAPPERS, POLISHERS, DRILLERS TO SPEED UP PRODUCTION

ROOS TOOL & MFG. CO.

49 BLOOMFIELD AVE., NEWARK, N. J.
PLANT AT MONTCLAIR, N. J. (NEWARK SUBURB)

DISTRIBUTORS:
CARBOLOY COMPANY, DETROIT, MICH.
CANADIAN GEN. ELECTRIC TORONTO, CANADA

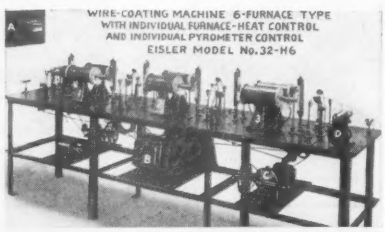
Wire-Coating Machine 6-Furnace Type with Individual Furnace-Heat Control and Individual Pyrometer Control (Temperature Test)

THE accompanying illustration shows the latest development of a filament wire coating machine for radio tubes, manufactured and marketed by the **Eisler Engineering Co., Inc.**, Newark 3, New Jersey.

* * *

IN this construction two coating units are independently mounted on a steel table structure of 12′ 5″ length, 38″ height. Each unit is provided with a series of three electric furnaces and has its own electric driving motor of 1/4 H.P., 1725 R.P.M. with variable speed reducer.

* * *


WIRE-COATING MACHINE 6-FURNACE TYPE
WITH INDIVIDUAL FURNACE-HEAT CONTROL
AND INDIVIDUAL PYROMETER CONTROL
EISLER MODEL No. 32-H6

Eisler filament wire coating Machine * * *

THE coating in each unit is performed by pulling the wire from a spool holder — placed at the extreme end of the table — over roller guides through the getter cups, filled with the proper coating material, baking the passing wires successively in the three furnaces at a strictly controlled temperature, and finally leading the now coated wire to the respective spool winder (D.D') on the other end of the table. The effectiveness of the baking process depends highly on the ability to maintain accurately a required temperature in the furnaces. For this reason individual heat adjustment is provided for each furnace by means of an auto-transformer with six individual heat selector switches to generate and to hold the correct and fully sufficient temperature in the furnaces. The temperature in each of the electric ovens can at any time be individually checked on a precision pyrometer (A), by means of a six point selector switch, one cold junction box (B) and six thermocouples (platinum-rhodium) one of them attached to each furnace. The thermocouples are connected to the pyrometer through the cold junction box. The standard cold end temperature in the box is 100°F.

* * *

PURPOSE of filament coating for radio tubes is to improve the electron emission and to amplify the electron current flow from cathode to anode.

* * *

New Bulletin on Brazing Alloy

HANDY & Harmon, New York 7, N. Y. has issued Bulletin No. 15 describing Easy-Flo 45, a recently announced silver brazing alloy with several new and exclusive features.

* * *

ITS lower silver content, lower operating temperature and fast spreading ability are factors which should interest all manufacturers who join metals. Copies of the Bulletin may be secured upon request.

* * *

Diamond Information Bureau Taken Over by Industrial Distributors, Ltd.

THE **Industrial Diamond Information Bureau** originally established in 1943 by The Diamond Trading Company Limited at 32-34 Holborn Viaduct, London, E.C.1. has been taken over by the Diamond Research Department of Industrial Distributors (1946) Ltd. (Incorporated in the Union of South Africa) and the Bureau will continue to maintain at the same address an up to date reference library on scientific and technical aspects of diamond, including patents, and to invite enquiries from users on industrial problems encountered in the industrial use of cutting tools, wire drawing dies, abrasives, and other applications of diamond. The monthly bibliography of literature dealing with matters relating to the industrial use of diamonds will continue to be published, and a free technical service to all industrial users of diamond will, where

possible, continue to be offered. All correspondence should be addressed to the Joint London Secretaries at the above address.

* * *

New Research Laboratory and Test Plant of Hanson-Van Winkle-Munning Company at Matawan, N. J.

A new Research Laboratory and Test Plant is being erected by **Hanson-Van Winkle-Munning Company** on their property at the corner of Church Street and Price Street, Matawan, N. J. The new building will incorporate an ideal environment and every facility for conducting research and development of the Company's products. The activities of the laboratory will further provide for experimental and test plant operations to establish each customer's specific requirements in equipment and supplies.

* * *

THE layout of the laboratory provides a grouping of the various functions in close proximity to provide an efficient arrangement for carryng out all of its activities. A maximum of natural lighting, accustical facility, mechanically filtered air ventilation and the studied use of materials will all be conducive to a congenial environment for creative work.

* * *

A large area on the first floor of the building will be devoted to the most advanced equipment and facilities for research and experimentation in plating processes of all kinds. Additional laboratories on the first floor will include one for the preparation of special solutions, an enamel and coatings laboratory, a buffing and polishing section and a corrosion testing laboratory.

* * *

THE second floor will have the office for the Director of Research and the laboratory staff, a large combination library and conference room, chemical research laboratories, a metallographic laboratory, dark rooms, a balance room and supply rooms.

WIRE SPOOLING MACHINES

The Charles P. Boyd Corporation now manufactures the high quality wire spoolers formerly made by the Fidelity Machine Company

Reasonable deliveries made

Priced right *Write for Catalogue*

CHARLES P. BOYD CORPORATION

202-206 No. Twenty First St. Philadelphia 3, Pa.

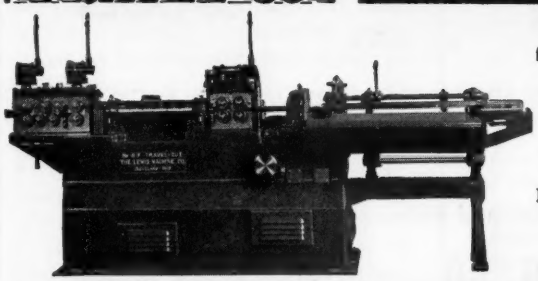
Wire for Modern Production

● Many manufacturing economies are possible with wire specially shaped for particular needs. Whatever your uses or fabricating methods are, there may be a Continental Manufacturers' wire to meet your exact requirements. Continental wire is made in many shapes, sizes and finishes.

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES - KOKOMO, INDIANA

LEWIS TRAVELCUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to 3/4" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

LEWIS

The LEWIS MACHINE Co., 3445 E. 76 St., Cleveland, O.

WE BUY WE SELL

We Pay Highest Prices for Used Machinery

WE OFFER

80 30" Adjustable Traverse TAKE-UP STANDS

All Machines Reconditioned in Our Own Shop

WIRE & TEXTILE MACHINERY INC.

P. O. BOX 104, PAWTUCKET, R. I.

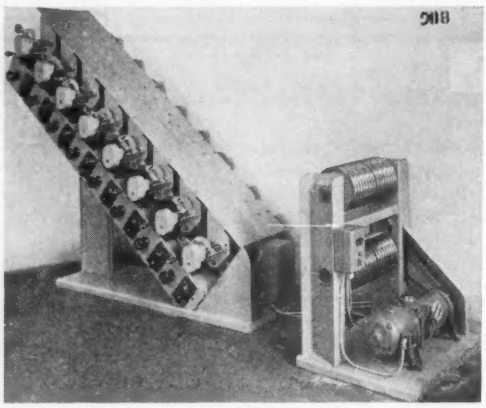
TO WIRE MILL MEN

The Wire Association is for the specific purpose of improving production methods. It has been organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

The inquiries discussed were received from and answered by members of the Wire Association. These inquiries are sent to the Secretary of the Association who acts as a central clearing point, and neither the names of the firms, nor individuals sending the inquiry, nor of the men or firms replying are divulged without permission.

MULTIPLE WIRE PROCESSING TAKE-UP No. 908

Each reel spindle individually controlled as follows: —



Ball-bearing Torque motor drive • Wire tension varied thru rheostat • Traverse is uniform as reel fills • Traverse adjustable for rate and width.

Multiple capstan sheaves driven by motorized variable speed transmission. Welded steel construction and ball-bearing thruout. Illustrating one of our new compact 16 unit inclined models.

"American" INSULATING MACHINERY COMPANY

517 West Huntingdon St.
Philadelphia 33,
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REELS **SPOOLS**

ALL SIZES

WOOD -- PLYWOOD -- WOOD-METAL

RETURNABLE NON-RETURNABLE

Samples and Prices on Application

DURKEE MFG. CO. **PINE RIVER, MINN.**

WIRE MANUFACTURING MACHINES

For

DRAWING — ANNEALING — TINNING — ENAMELING

STRANDING — SPOOLING — COILING

Aluminum Reels And Spools

We Will Build Machines To Your Specifications

Write For Information

LARIBEE MACHINE Co. Inc. • CAMDEN, NEW YORK

Folder Describes Plated Strip

AN interesting folder is put out by **American Nickeloid Company,** Peru, Ill., in which are described their line of electro-bonded strip furnished in coils from 1/8″ to 24″ wide.

* * *

NICKEL, chromium, brass or copper are provided in a variety of finishes on a steel base. The coils come ready to be fed into automatic forming machines.

* * *

COPIES of the folder and additional information may be secured by writing the company.

* * *

A.G.A. In National Expositions

THE **American Gas Association** will sponsor a gas exhibit at the National Metal Congress and Exposition in the National Amphitheatre, Chicago, October 18-24 where the latest in industrial gas equipment will be on display in the largest single exhibit of the Exposition. Centrally located opposite a main entrance, the exhibit will be a focal point for persons interested in industrial gas.

* * *

THIS exposition will afford an opportunity for gas men, manufacturers, and industrial and commercial gas consumers to meet and discuss their respective problems.

* * *

SKF TO EXPAND

A two-year modernization and expansion program, that will find **SKF Industries, Inc.,** spending more than $4,000,000 to equip its two Philadelphia plants with new machinery, capable in some instances of operating from two to six times faster than standardized equipment long used in the anti-friction bearing industry, was recently announced by Thomas W. Dinlocker, vice president.

* * *

WHILE the bulk of the expenditures will go for new machinery required in the production of anti-friction bearings, the program is aimed primarily at stepping up production of spherical roller bearings, of which SKF is the nation's largest single manufacturer.

SPOOLS...
REELS...
BOBBINS
● IF IT CAN be wound on a reel, spool or bobbin, Apco Mossberg can fill your needs.
For over 50 years we have specialized in the manufacture of spools and reels of all kinds. Our plant is equipped to manufacture almost any conceivable kind, type and size of steel spool, reel and bobbin, in large quantities or small.
Write for our brochure containing useful information on a wide variety of our spool and reel products.
APCO MOSSBERG CO.
Attleboro, Mass., U. S. A.
Canadian Representatives:
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Ontario, Canada

LOST

HOW many thousands of dollars worth of acid and metal needlessly go down the pickling-tank drain each year because of inhibitor shortcomings? Don't take chances on YOUR hot sulfuric pickling jobs! Specify OAKITE PICKLE CONTROL NO. 3. Saves dollars, improves pickling procedure, produces cleaner metal. Ask for FREE copy of NEW six-page Special Service Report. No obligation.

OAKITE PRODUCTS, INC.
52A Thames Street, New York 6, N. Y.
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE *Specialized* **CLEANING**
MATERIALS • METHODS • SERVICE

ADDITIONAL floor space for increased production of spherical roller bearings, widely used in the rail equipment, steel, paper-making and other industries, is being gained in the Philadelphia plants, despite a severe building crisis in the area. The company's metal stamping and cast iron departments will be transferred beginning July 15 to newly-acquired plants at Shippensburg, Pa., and Hornell, N. Y., to clear space in the main plants.

* * *

Issues House Organ

EBERBACH and Son Co., Ann Arbor, Michigan, publish a house organ called "The Announcer". Copies of this may be secured by writing the company, who are manufacturers of scientific instruments and supplies for laboratories. Their June issue is devoted to the subject "Coal" and describes various situations in which instruments are employed in the industrial uses of coal.

* * *

Forms New Company to Handle Stainless Steel

EDWARD G. Cressell announces the establishment of the **Cressell Stainless Steel Company,** 333 North Michigan Avenue, Chicago 1, Illinois, a sales service engineering company to handle Stainless Steel in all forms.

* * *

MR. Cressell was Chicago District Manager of the Geary Stainless Steel Company, Baltimore, Maryland. Prior to that he was associated with American Rolling Mills and Rustless Iron and Steel Corporation. Mr. Cressel came to Chicago in 1933 as District Manager of The Crosby Company, Buffalo, New York, which position he held until 1943 when he resigned to join the staff of Rustless Iron and Steel Corporation.

* * *

New Book Covers Polishes and Cleaners

A book entitled **"Modern Polishes and Specialties"**, covering the raw materials, manufacture and production of polishes and cleaners has been published by the **Chemical Publishing Co., Inc.**, 26 Court Street, Brooklyn 2, New York.

WIRE CUTTING MADE EASY

Hard wire*, spring wire, as well as soft wire, wire fabric, tie wire, fencing, etc. — easily and quickly cut with a porter tool. A standard model for average needs. Special models for special work.

Send for catalog showing all Porter models of wire cutters, bolt clippers, etc.

**(with center cut round edge jaws)*

H. K. PORTER, INC.
74 FOLEY STREET
SOMERVILLE 43, MASS.

PORTER HKP CUTTERS

BORAX
for
Wire Drawing

After pickling, BORAX can be applied with one dip; dries in three minutes in an oven temperature of 150° F. to provide a coating that will not check or flake off in storage. Dissolves readily in water and is dust free. BORAX, other than being an excellent vehicle for picking up the drawing lubricant, is rust inhibiting and a natural flux that will facilitate the making of good butt welds. Use BORAX to make better wire at less cost. Used in many mills.

Send for complete particulars

PACIFIC COAST BORAX CO.
51 Madison Ave., New York 10, N. Y.

VIANNEY

Famous Wire Drawing Diamond Dies

These famous Diamond Dies are now produced here at moderate prices.

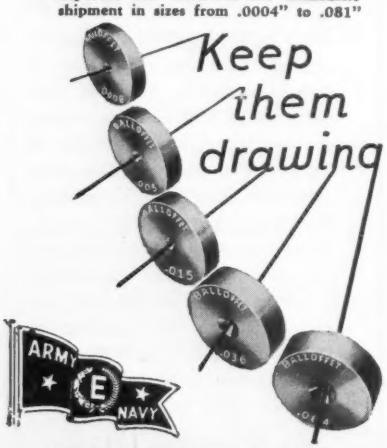
All sizes are in stock or made to order to your specifications

VIANNEY WIRE DIE WORKS

250 E. 43rd. St., New York
V. J. Boulin, Manager

Balloffet DIAMOND DIES

Large stock on hand of domestic and imported dies available for immediate shipment in sizes from .0004" to .081"



Quality Diamond Dies since 1870

BALLOFFET DIES AND NOZZLE CO., INC.

68-25 Adams at 68th Street
Guttenberg, New Jersey

Union 3-3155

IT is edited by **W. D. John**, M.A., B. Sc., consulting industrial chemist and contains 313 pages of material with more than 700 modern formulae. This is a technical handbook of practical assistance to chemists, technicians and executives engaged in the specialty industries that are interested in these categories of products. The contents are embraced in 22 chapters, each covering different kinds of products. The price is $7.50.

* * *

Roxalin Becomes Affiliated with Interchemical Corporation

ROXALIN Flexible Finishes, Inc., and **Interchemical Corporation** announce that Roxalin's operations have been integrated with Interchemical Corporation — Finishes Division. The resources of both, combined within the framework of Interchemical's Finishes Division, will provide users of Roxalin and Interchemical finishes with the technical skills and manufacturing facilities of both these research-minded organizations.

* * *

BOTH Roxalin and Interchemical Finishes' customers will continue to be served by the personnel familiar with their specific requirements; respective brand names will largely be maintained.

* * *

THE benefits of this merger of resources should be apparent in the months ahead, in the integrated technical and plant facilities of the two organizations. Interchemical's Interrelated Research program, which applies the lessons learned in one field to the solution of problems in another, will now call upon and augment Roxalin's reservoir of experience.

* * *

ACID AND ALKALI PROOF LININGS AND MORTARS

●

ACID PROOF CONSTRUCTION

●

THE CEILCOTE CO.

Consulting and Research Engineers

750 ROCKEFELLER BLDG.
CLEVELAND, OHIO

Federal Products Enlarges Main Plant

FEDERAL Products Corporation of Providence, Rhode Island has completed the addition of a modern three-story extension and also a third-floor to its main plant on Eddy Street. The original building, which was of comparatively recent construction, has been modernized in every respect.

For QUALITY DIES For EVERY NEED "TRY" WAYNE WIRE DIE CO.

Called "THE BEST DIES OBTAINABLE" and giving MAXIMUM service at MINIMUM cost. Complete die service on round, shaped, extrusion, tubing etc., dies. New or rebuilding of all types of DIE EQUIPMENT.

WAYNE WIRE DIE CO. 200 Pennsylvania Ave., Hillside, N. J. Telephone: Elizabeth 2-2456

DIAMOND DIES .0006 - .120 DIAMOND POWDER
INDUSTRIAL
AJAX
SUPPLIES INC.
R.R. 4, P.O. Box 66, Fort Wayne Ind.

NEW ENGLAND WIRE DIE CO.
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EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
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DRAWING DIES
INDIANA WIRE DIE COMPANY
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DIES
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WIRE DIE CORPORATION
19 W. 34th St. New York

DIAMONDS for WIRE DRAWING DIES and CUTTING TOOLS
DIAMOND POWDER UNIFORM QUALITY
CHAMPION DIAMOND COMPANY, INC.
551 Fifth Ave., New York 17

Wire Drawing Diamond Dies

COCHAUD
WIRE DIE CORPORATION
300 W. 56th St., NEW YORK
Tel. COl. 5-1340

THE machinery from their Reservoir Avenue and Willard Avenue plants has been installed in the enlarged Eddy Street plant so that the entire organization is now under one roof. The Willard Avenue plant is to be retained as a warehouse.

* * *

Spring Manufacturer Sends Customers "Pictures" Of Quality

MANY a company has looked forward to the day when it could give its customers an accurate picture of the quality of the products it ships.

* * *

HUNTER Pressed Steel Company, Lansdale, Pennsylvania, a manufacturer chiefly of precision springs, announces a service of this kind which may be marking a new high in customer-supplier relationships.

* * *

HUNTER is recognized as one of the trail-blazers in Statistical Quality Control. It has for years used statistical methods for the control of quality.

* * *

THE operation of the new service is simple. Each customer who desires it, receives what is called a "QR" or Quality Report by mail immediately after final inspection. This arrives in advance of the shipment and may be related to it easily through a report number.

* * *

IT is a copy of the final sampling Quality Report regularly made by Hunter inspectors. It is in the form of a frequency distribution of the test load values and consequently presents the information most needed in a manner most readily and easily understood.

* * *

DEVELOPMENT of these reports, believed to be the first service of its kind, is an outgrowth of new inspection method. It would not have been practical at all had not Hunter organized an Apparatus Division to devise and build an entirely new line of fast, accurate, electronically-operated testing machines. Otherwise, the cost of making and recording individual tests

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on samples of 50 to 200 springs would have been prohibitive, especially when applied to every lot of springs shipped.

* * *

THOSE who have had an opportunity to use the Quality Report are almost unanimous in saying that it will soon become an integral part of the buying and selling procedure. This possibility has, in fact, been predicted by technical journals.

* * *

Carbide Sizing Dies Eliminate Servicing

CARBOLOY cemented carbide dies are reported to have virtually eliminated die servicing in swaging and sizing of small steel links at **Underwood Corporation, Bridgeport,** Connecticut.

* * *

THE operation consists of sizing two "hubs" and swaging the top of the link to "form". Portions are flattened at both ends of each link. The diameters "B" of the links are held to .071″ - .072″. The die is also required to hold a constant distance between the two diameters "B".

* * *

TWO Carboloy bushings are mounted in a hardened steel platen. The top portion of the die is plain. The two plugs "C" have a slip fit in the holes of the bushings. These holes in the Carboloy bushings are made to .071″ diameter. The plugs are cam-operated. They eject finished links from the die and are also used to determine the length of the link ends "B".

* * *

LINKS are of S.A.E. 1010 cold drawn wire of .0695″ diameter, cut to required length and with the two ends bent as shown prior to forming. A strip of the proper length is inserted in the die, pressure is exerted, and the finished link ejected from the die.

* * *

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their installation and the last production report has been about 30,000 pieces. At this time production was stopped in order to switch to other products, temporarily. Since no detectable signs of wear were found on the Carboloy inserts at the 30,000 mark, it is estimated that a million pieces can be produced from the die before it will require servicing.

* * *

Surface Combustion Adds Two New Furnaces to Its Line

THE BALCO Atmosphere Furnace and the BALCO Gas Carburizing Furnace are two new prepared atmosphere furnaces that **Surface Combustion Corporation** has just added to its Standard-Rated line of heat treating furnaces.

* * *

BOTH of these new furnaces utilize 'Surface' "RX" Gas as the protective atmosphere. A distinctive characterstic of "RX" gas in addition to being non-oxidizing is that its carbon potential can be accurately controlled to be in perfect balance with a desired carbon content of steel. This makes it possible to obtain a scale free, heat treated product with a selected surface carbon content. Formerly available only for specially designed furnaces, the balanced carbon principle of heat treating is now available to users of smaller standard furnaces. Hence the name BALCO, derved from BALanced Carbon Odixes.

* * *

THE RX Atmosphere used in these furnaces is produced by a patented process which consists of passing a rich air gas mixture of either natural or a petroleum gas thru a heated tube filled with a catalytic refractory material. The resultant atmosphere is composed of approximately 20% carbon monoxide, 40% hydrogen and 40% inert nitrogen. For high carbon balances RX Gas is enriched to the required degree with additional undiluted natural or petroleum gas.

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CURRENT interest in the high melting point fats for smoother drawing of stainless steel alloys has led to new developments by **Nopco Chemical Company** of Harrison, New Jersey. These fats, such as hydrogenated castor oil, are ordinarily used as such or dissolved in solvents.

* * *

NOW, however, Nopco has developed a **water dispersible** form of hydrogenated castor oil (Nopco GVH) as well as other high melting point fats. These new products, which may be supplied in 100% solids form, are recommended for the wet drawing of ferrous and non-ferrous shapes, tubes, rods and wire.

* * *

IN addition to processing certain fats to obtain melting points approximately double those of the fats ordinarily used, Nopco's developments include fats containing specific chemical groupings which contribute to surface activity and extreme pressure lubrication. Accordingly, the products are particularly recommended for the non-corrosive alloys such as stainless steel, Inconel, cupra-nickel and certain bronzes, although considerably longer die life may be expected when they are used on the common ferrous and copper and brass alloys. Samples of these new water dispersible products are available for experimental use.

* * *

Report Analyzes New Labor Law

EMPLOYERS get no vacation from labor relations responsibilities under the nation's new labor law. This point was emphasized when The Bureau of National Affairs, Inc., released a 300-page analytical report on the new statute and its meaning.

* * *

INDEED, employers may now be penalized for certain actions which, for years past, have had the blessing of the administration and the courts — refusing to hire non-union workers, for example, or contributing to a union-administered health and welfare fund.

* * *

THE 12-year-old Wagner Act listed five "unfair labor practices" for employers; the new law retains every one of these. On top of them it enacts a series of "unfair" union practices, of which the employer is expected to be a chief policeman. These include "coercion" of employees, jurisdictional and organizational strikes, boycotts, and refusal to bargain.

* * *

APART from the question of foremen's unions, which lose legal protection under the new law, the long line of precedents built up over a decade by the National Labor Relations Board remain almost intact, the BNA report points out. With regard to union curbs, the report indicates, a large amount of discretion is vested in the NLRB, and just how "tough" the new law will be depends on the way in which the Board decides cases coming before it in the next few years.

* * *

THE BNA report analyzes the new law, section-by-section; reproduces text of the statute and its legislative history; and previews the impact of the legislation on such subjects as strikes, picketing, closed shops, employee elections, government powers, collective bargaining and arbitraton.

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Spencer Wire Company

(Continued from page 656)

in with wire rods and the common products, but there was no quality connection. Mr. Goddard was decidedly cool. As a matter of fact he himself had nourished the idea of a merger of all the independents of the district; he had bought land and engaged a good man to look over the situation with regard to a rod mill. In talks with his intimates the **"General Steel & Wire Corporation"** was often on his lips. It irked him no little to have the ball snatched away from him by a stock broker, and to see the control going elsewhere. But when it became clear that the merger had gone too far to miscarry, when the **Wickwire** definitely agreed to follow him into the fold, and definitely promised him the management and direction of the whole enterprise, (a promise later broken,) Mr. Goddard yielded, sold the Village plant, and leased the Worcester mills to the corporation. The **Spencer Wire Company** came to an end in October, 1919.

* * *

BOTH plants ran on, as **Spencer Works** and **Goddard Works** of the corporation. The Wire Village mill has been mentioned in several re-incarnations: Goddard works ran as such for about twenty years, but during the last five years it was gradually stripped, and its functions shifted to the Buffalo plant, to which many of the personnel followed. There is now nothing left.

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Index To Advertisers

A

Ajax Industrial Supplies Inc. 691
Aluminum Company of America 627
American Chemical Paint Co. 680
American Insulating Machinery Company 688
American Steel & Wire Company 645
Anchor Wire Corp. 691
Ansonia Electric Division
Noma Electric Corp. 639
Apco Mossberg Company 689
Apex Alkali Products Co. 641

B

Balloffet Dies & Nozzle Co., Inc. 690
Bethlehem Steel Co. 626
Boyd, Charles P., Corp. 687
Bridge Mfg. Co., The 963

C

Carboloy Company, The 625
Carl-Mayer Corp., The 684
Ceilcote Co., The 690
Champion Diamond Co., Inc. 691
Cleveland Tramrail Division of the
Cleveland Crane & Engineering Co. 695
Cochaud Wire Die Corporation 691
Columbia Steel Company 645
Continental Steel Corporation 687
Crepe-Kraft Co., The 693

D

Durant Mfg. Co. 693
Durkee Mfg. Co. 688

E

Eastern Tungsten Carbide Co. 691
Ecca Machine Corp. 694
Eisler Engineering Co. 692
Electric Furnace Company ..... Back Cover
Emory, Robert J., Company 694
Engis Equipment Corp. 681
Entwistle, James L., Co. 631

F

Firth-Sterling Steel & Carbide Corp. 650
Fort Wayne Wire Die, Inc. 691
Furnace Engineers, Inc. 692

G

Glader, Wm. Machine Works 674
G. & V. Machine Co. 685

H

Hayes, C. I. Company 683
Haveg Corporation 693
Howsam Spool Co. 693
Hubbard Spool Company 646
Hudson Wire Co. 632
Hughesville Machine & Tool Company 676

I

Indiana Wire Die Company 691
Industrial Ovens, Inc. 693

J

Johnson Steel & Wire Co., Inc. 684
Jones & Laughlin Steel Corp. 657

K

Keagler Brick Company 693
Kelly Wire Die Corporation 691
Keystone Steel & Wire Co. 671

L

Lancaster Allwine & Rommel 695
Laribee Machine Co. 688
Lewis, K. B. 695
Lewis, Machine Co., The 687

M

Magnus Chemical Company 630
Malin & Company, The 692
Metal Carbides Corporation 692
Micro Products Company 670
Miller, R. H. Company, Inc. 679
Morgan Construction Company 648
Mossberg Pressed Steel Corp. 675

N

National Annealing Box Co. 694
National Machinery Exchange 695
National Rubber Machinery Co. 673
New England Butt Co. 636
New England Wire Die Co. 691
Niles Steel Products Div., Republic Steel Corp. 649
Norton Company, The 685
North American Philips Co., Inc. 693

O

Oakite Products, Inc. 689
O'Neil-Irwin Mfg. Co. 693
Owens-Corning Fiberglas Corp. ..... 658 A & B

P

Pacific Coast Borax Corp. 689
Parkin, Wm. M. Co. 694
Platt Brothers & Co., The 693
Porter, H. K., Inc. 689
Potter, Neil C. 693

R

Reed and Richards Transatlantic, Inc. 682
Robertson, John Co., Inc. 628
Roebling's, John A., Sons Company 692
Roos, H. & G., Tool & Mfg. Co. 686
Ross, J. O., Engineering Co. 693
Royle, John & Sons 677
Ruesch, H. J., Machine Co. 694
Rusch Wire Die Corporation 691

S

Sauereisen Cements Co. 694
Scott Testers, Inc. 694
Scudder, E. J. Foundry & Machine Co. 693
Shuster, F. B., Mfg. Co., The 672
Sleeper & Hartley, Inc. 692
Standard Industrial Compounds Co. 635
Standard Varnish Works 633
State Machine Tool Co. 692
Steel Equipment Corp. 694
Surface Combustion Corp. 694
Syer, Raymond C. 695
Syncro Machine Company 644

T

Tennessee, Coal, Iron & R. R. Co. 645
Torrington Manufacturing Co. 692
Tungsten Alloy Mfg. Company 693
Trauwood Engineering Co., The 695

U

U. S. Steel Export Co. 645

V

Vascoloy-Ramet Corp. 637
Vaughn Machinery Co. ..... Front Cover
Vianney Wire Die Works 690

W

Waterbury-Farrel Foundry and Machine Co. 692
Watson Machine Company ..... Inside Back Cover
Wayne Wire Die Co. 690
Wean Equipment Corp. ..... Inside Front Cover
Wilson, Lee, Engineering Co., The 692
Wire & Textile Machinery, Inc. 687

Y

Youngstown Sheet & Tube Company 634

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American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds, Co., Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery Inc., Pawtucket, R.I.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich
Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago. Ill.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Champion Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Lead Extrusion
Eastern Tungsten Carbide Co., Newark, N. J
Robertson, John, Co., Brooklyn, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Co., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
New Eng. Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc. Guttenburg N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenburg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport. Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Tungsten Alloy Mfg. Co., Newark, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIRECT ELECTRIC RESISTANCE HEATING—
Trauwood Engineering Co., The, Cleveland Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

DRYING & PRE-HEATING ROOMS—
Carl-Mayer Corp., Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O. Engr. Corp., New York, N. Y.

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass
Syer, C. Raymond, Westport, Conn.

EQUIPMENT—Insulation Testing
Entwistle, James L., Co., Pawtucket, R. I

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engrs. Inc., Pittsburgh, Pa.
Hayes, C. J., Co., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland Ohio.
Wilson, Lee Engr. Co., Cleveland, Ohio

WHERE TO BUY, Continued

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. J., Co., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Galvanizing Equipment
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING KETTLES
National Annealing Box Co., Washington, Pa.

GRINDERS—Roll
Norton Co., Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of Cleveland.
Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Ansonia Electric Div.,
Noma Electric Co., Ansonia, Conn.
Owens-Corning Fiberglas Corp., Toledo, Ohio.
Standard Varnish Wks., Staten Island, N. Y.

KETTLES—Galvanizing, Annealing, Tinning, etc.
National Annealing Box Co., Washington, Penna.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LININGS—Acid and Alkali Proof
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Phila., Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bale Tie
Reed and Richards Transatlantic, Inc., New York, N. Y.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Entwistle, Jas. L. Co., Pawtucket, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, New York
Morgan Construction Co., Worcester, Mass.
National Machy. Exch. (Used), New York, N.Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Copper Wire Drawing and Rolling
American Insulating Mach'y Co., Phila, Pa.
National Machy. Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila, Pa.
G. & V. Machine Co., Paterson, N. J.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch., (Used), New York, N.Y.
Porter, H. K. Inc., Everett, Mass.
Shuster, F. B. Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Roos, H. & G., Tool & Mfg. Co. Montclair, N.J.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, O.
Laribee Machine Co., Inc., Camden, New York
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Extruding
G. & V. Machine Co., Paterson, N. J.
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Fence
Glader, Wm. Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N. Y.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Reed and Richards Transatlantic Inc., New York, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Galvanizing
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co, Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila, Pa.
G. & V. Machine Co., Paterson, N. J.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of the Cleveland.
Crane & Engineering Co., Wickliffe, O.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm. Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Pointing
Morgan Construction Co., Worcester, Mass.
National Machy. Exch. (Used), New York, N.Y.

WHERE TO BUY, Continued

Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber for Insulating Wire
G. & V. Machine Co., Paterson, N. J.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Rubber Tubing and Straining
G. & V. Machine Co., Paterson, N. J.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila, Pa.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Rubber Machinery Co., Akron, Ohio.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Boyd, Charles P., Corp., Philadelphia, Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, New York
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N .J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machinery Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Staple
Reed and Richards Transatlantic, Inc., New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Huhgesville Machine & Tool Co., Hughesville. Pa.
Laribee Machine Co., Inc.. Camden, New York
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch. H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Mach'y Exch. (Used). New York, N. Y.
Ruesch, H. J., Machine Co., Newark. N. J
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N .J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N .J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery Inc.. Pawtucket, R.I.

MACHINERY—Testing Equipment—Sparkers
Entwistle, Jas. L., Pawtucket, R. I.
Wire & Textile Machinery Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila, Pa.
Laribee Machine Co., Inc., Camden, New York
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
New England Butt Co., Providence, R. I.
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Industrial Ovens, Inc., Cleveland, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
American Insulating Mach'y Co., Phila, Pa.
Eisler Engineering Co., Newark, N. J.
Laribee Machine Co., Inc., Camden, New York
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J .

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem Rolling and Edging
Torrington Mfg. Co., Torrington, Conn.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O. Engr. Corp., N. Y., N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAINTS—Marine
American Chemical Paint Co., Ambler, Pa.

PAINTS—Structural Steel
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING TANK LININGS—
Ceilcote Co., The, Cleveland, Ohio.
Sauereisen Cements Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.

PIPES & FITTINGS—Acid Resistant
Ceilcote, Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio.

POTS—Lead Melting
National Annealing Box Co, Washington, Pa
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co,. Phila, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach., Co., Trenton, N.J.
Sleeper & Hartley, Inc, Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REELS—Annealing and Stranding
Howsam Spool Co., Aurora, Ill.

REEL AND TENSION STAND—
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc, Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

REELS—Steel
Apco Mossberg Co., Attleboro Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Bridge Manufacturing Co., Hazardville, Conn.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Wire & Textile Machinery Inc., Pawtucket, R.I.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Bridge, Manufacturing Co., Hazardville, Conn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster. F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div. Republic Steel Corp., Niles, Ohio.

REELS—Wooden
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O. Engr. Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.

RUST REMOVING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

SATURATION SYSTEMS
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company,. Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

SPRINGS—Tools for Forming
State Machine Tool Co., Hartford, Conn.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

TANK LININGS—Brick
Ceilcote Co., The, Cleveland, Ohio.
Keagler Brick Co., Steubenville, Ohio.

TANK—Compound
Haveg Corporation, Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Ceilcote Co., The, Cleveland, Ohio.
Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TOOLS—Spring Forming
State Machine Tool Co., Hartford, Conn.

TOOLS—Wire Cutting
Porter H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe. O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

TREADS—Safety
Norton Co, Worcester, Mass.

TUBE BENDERS AND FORMERS—
Ruesch, H. J. Machine Co., Newark, N. J.

VALVES & FITTINGS—Acid Resistant
Haveg Corporation, Newark, Del.

VARNISHES—For Insulation
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y Co., Phila, Pa.
Entwistle, James L. Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, O.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery Inc., Pawtucket, R.I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland-Chicago-New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Electric
Ansonia Electric Div., Noma Electric Co., Ansonia, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Corp., New York, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland-Chicago-New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
Ecca Machine Corp., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.

WIRE—Nickel Silver and Phosphor Bronze
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Anchor Wire Corp., Jamaica, N. Y.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland-Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARNS & TAPES
Owens-Corning Fiberglas Corp., Toledo, Ohio

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

Wire & Wire Products

September, 1947

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

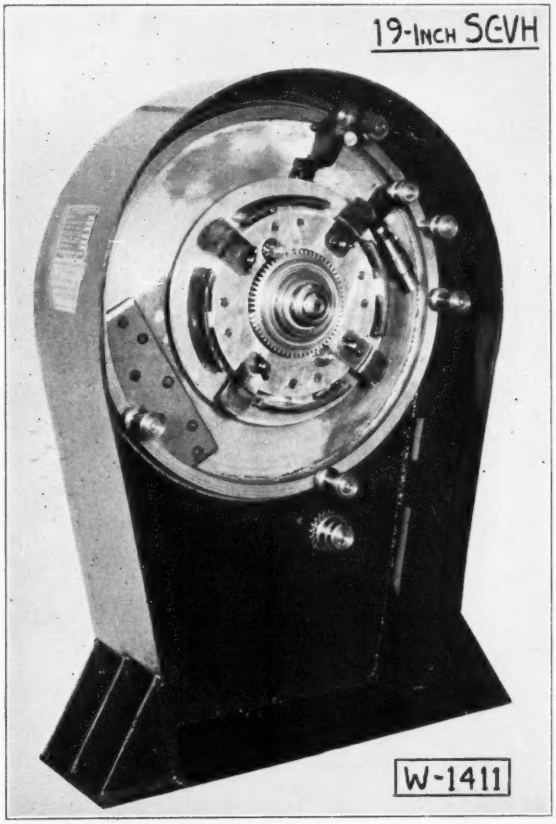
SINGLE & DOUBLE CONCENTRIC METALLIC TAPING HEADS

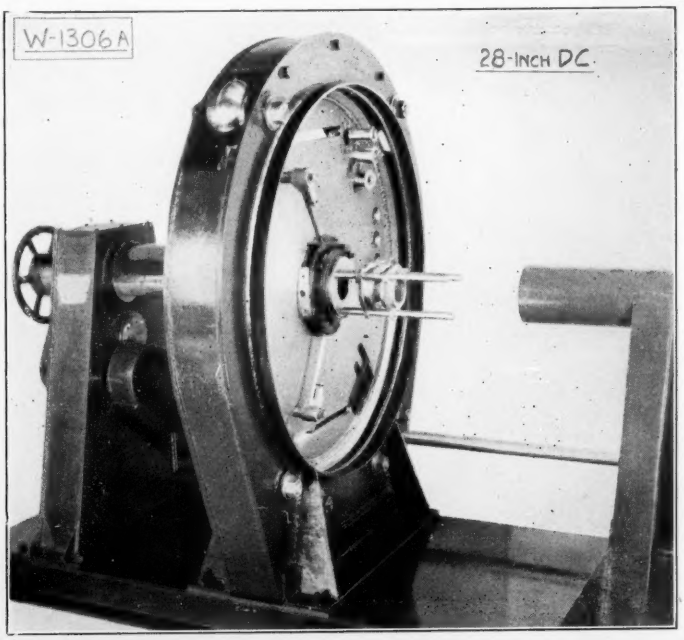
LONG RUNS at HIGH SPEEDS result in MAXIMUM ECONOMY and make these heads the preferred medium for the work which they are designed to perform.

* * *

Cut W-1411 shows our 19" SC-VH **Single** Concentric Head which loads a standard 19" x 16" x 2½" wide, universally wound steel tape pad (as it comes from the mill). Deformed (oval) pad eyes cause no loading trouble as the expanding chuck center adjusts for eyes of from 15" to 16" diameter. No special tools are needed to set the chuck. Long-drift uniform-tension allows tension adjustment from 7 to 30 pounds. Centering die-holder is non-rotating, extendable and passes diameters to 2 inches. Construction is of stress-relieved Fabricated Steel, Steel Castings, heat treaded max. strength Aluminum Alloy and Ball Bearing throughout, including the hard surfaced Guide Rollers. A Magazine for storing the required number of tape pads, to avoid cable cutting or re-winding of pad on head, is furnished with the head. Rotor Assembly is dynamically balanced and runs quietly without any vibration. **The speed is 600 R.P.M.**

The chief employment of this head is for joint-operation with Service Entrance Cable Machines — but — Special Heads of this design, altered to mount a 100-pound steel pad (22" x 15" x 2½") for small Parkway Armoring with 20-Mil. tapes and operating at 300 R.P.M. have been furnished and are in successful operation.





Cut W-1306A shows our 28" DC **Double** Concentric Head which loads two (2) 28"x14"x2" (max.) Tape Pads. Pads are carried on expanding chuck centers. A pad is carried on each side of the rotor, both tapes being applied simultaneously, thus insuring proper registration. Construction is of Steel and Ball Bearings throughout. Center passes 4-inch diameters. Two magazines for replacement pads are provided with the head. The rotor assembly is dynamically balanced and operates without vibration. **The speed is 300 R.P.M.**

The chief employment of this head is the application of heavy steel tape to Parkway (underground) and other Tape Armored Cables. It stands acclaimed as the most economical heavy tape applier to Cables of approx. 1½" diameter.

Because of tape angle interference this head is **not recommended** for use on diameters over 3-inches. Our Double Eccentric Heads, loading same pad diameters to 2-1/2" width, will serve at peak economy for larger cables (to 6" dia.) and where short runs and a considerable variation in cable diameters prevail.

EF

GAS FIRED, OIL FIRED and ELECTRIC FURNACES

for any heat treating requirement

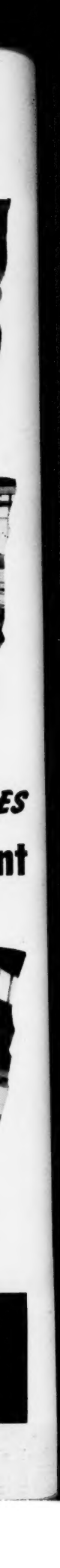
● EF furnaces are built in many different types—suited for performing a wide variety of different heat treating processes. They are available in sizes to meet any capacity requirement, and reflect the advantage of the many service-proved features conceived and perfected by EF engineers, during the company's 30 years experience,—and available only in EF furnaces. These include the EF radiant tube, EF heat exchanger, EF alloy steel electric grids, EF roller design and mounting, EF atmosphere generators and many other devices that assure uniform temperature throughout the furnace—more accurate control of the heat within the required limits, low stack temperatures, increased outputs, reduced maintenance, and uniform, low cost, dependable operation.

Investigate the EF advantages—and let EF engineers, with their long and outstandingly successful record, work with you on your next heat treating job.

EF

THE ELECTRIC FURNACE CO.

WILSON ST. AT PENNA. R.R.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES
FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem-Ohio